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EXTERNAL OPERATIONS ON THE NASAL ACCESSORY SINUSES

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In this article I propose to confine my remarks to the surgical aspects of chronic inflammatory disease of the nasal accessory sinuses. The ethmoid labyrinth, as regards both its position and its relation to the formation of nasal polypi, occupies a key position, and it therefore demands special consideration.

A comment on the anatomy of the nasal sinuses will not be out of place as a prelude to a description of operative procedures.

ANATOMIC RELATIONS

The maxillary antrum, for all practical purposes, and the frontal and the sphenoid sinus are contained in the respective bony elements in which they develop. This is not the case with the ethmoid labyrinth of cells, which requires for completion other bones of the skull. The upper ethmoid cells are roofed in by the orbital plate of the frontal bone. This is pitted by numerous depressions, each of which forms a cap for an individual cell. The anterior and external ethmoid cells are completed by the application of the ascending process of the superior maxilla and the lacrimal bone. The proximity of the lacrimal apparatus, lying in a groove on the orbital surface of the lacrimal bone and separated from the ethmoid cells by a thin layer of bone, is of considerable surgical importance. Below, the orbital plate of the maxilla closes in the lower ethmoid cells. Sometimes one or more of these cells can be observed extending outward into this plate, which forms the superior wall of the antrum and most of the lower wall of the orbit. These cells may be termed antroethmoid. They have been classified as maxilloethmoid, but such a term might apply to any other cells in the formation of which these two bones are concerned. Infection may spread downward from the antroethmoid cells to the antrum or upward to the orbit, causing, on the one hand, empyema of the antrum, on the other, a subperiosteal abscess of the orbit. Posteriorly, the ethmoid bone articulates with the sphenoid (fig. 7).

From the London Hospital.

It is obvious that, owing to the composite formation of the ethmoid galleries, any radical operation on the ethmoid must also concern other cranial bones (fig. 6).

The posterior and lower ethmoid cells are generally larger than those situated in front and above. Cells usually referred to as fronto-ethmoid may occur in relation to the floor of the frontal sinus and the roof of the orbit. The term ethmo-orbital is preferable, as, strictly speaking, all the upper ethmoid cells are frontoethmoid, since the frontal bone takes part in their formation. A bulla may be present on the floor of the frontal sinus as the result of the bulging upward of an

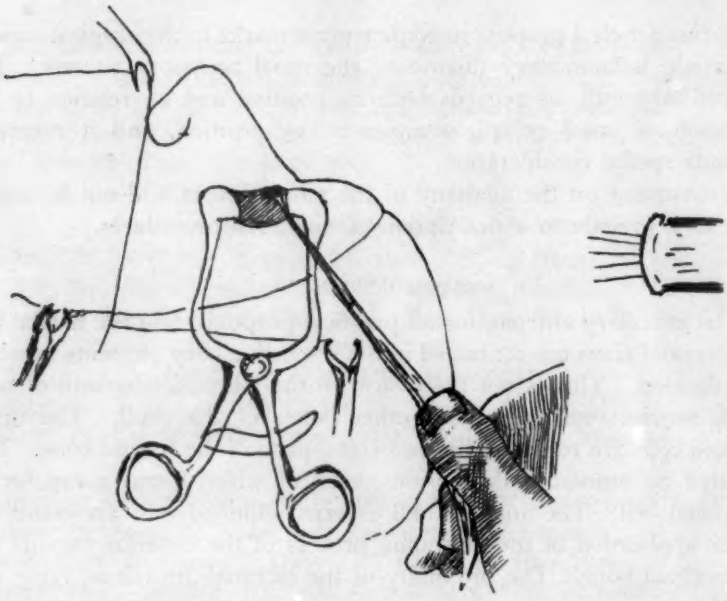

Fig. 1.—Relative positions of the surgeon and the patient in exploration of the frontonasal duct and investigation of the anterior ethmoid cells from above.

ethmo-orbital cell. An ethmoid cell situated below the frontal sinus may extend outward nearly as far as the zygomatic process and backward as far as, or even above, the sphenoid sinus, insinuating itself between this sinus and the cranial cavity and entering into relationship with important structures, usually in close association with the sphenoid sinus. An ethmo-orbital cell may be represented by a mere horizontal slit, which is easily overlooked during an operation on the frontal sinus.

When ethmoid cells wander away from the main mass of the ethmoid labyrinth, the difficulty of carrying out a radical operation is much increased, and complete exenteration may be possible only if an operation on the frontal sinus accompanies that on the ethmoid cells.

OPERATIVE PROCEDURES

Operations on the nasal sinuses may be carried out by three routes of approach: (1) through the nasal cavity; (2) through the mouth and (3) by employment of an external incision. The method chosen depends on the particular sinus or sinuses involved, the type of the disease and the route most favored by the operator.

1. All the sinuses can be dealt with by the nasal route, the antrum often with success (intranasal antrostomy). The ethmoid cells can be

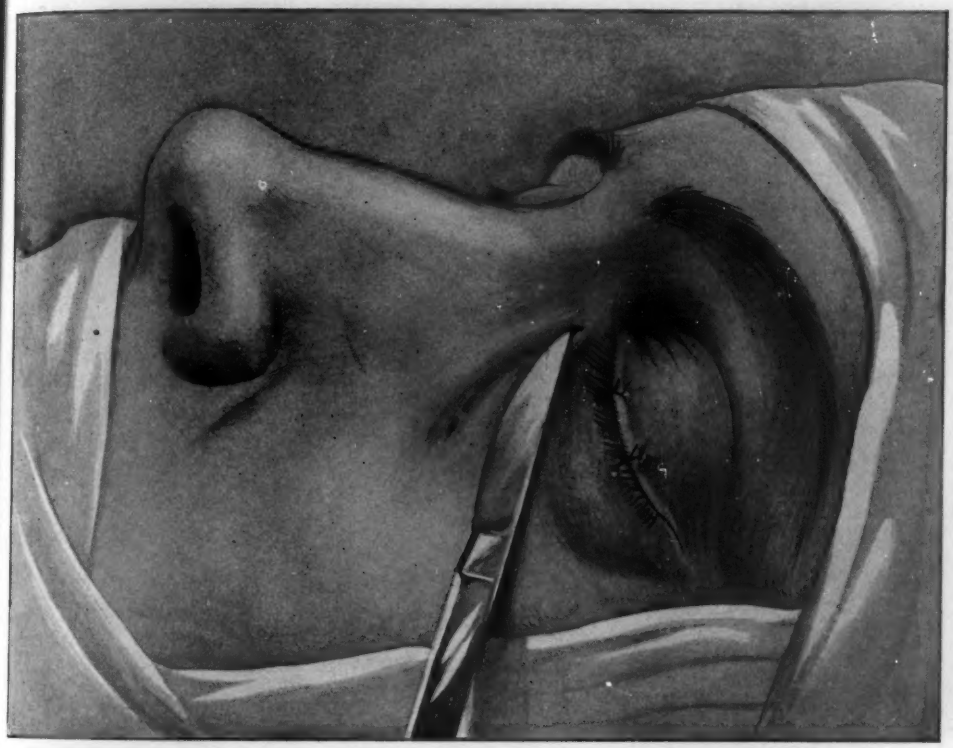

Fig. 2.—Preliminary incision. The blade of the knife lies parallel to the skin, so that the latter is cut obliquely. The upper and lower eyelids are temporarily approximated by sutures.

treated only incompletely, radical operation by this means of access being impossible; the sphenoid sinus can be drained by enlarging the natural ostium; the so-called intranasal operation on the frontal sinus, with the object of improving drainage, an operation, fortunately, no longer in favor, must be considered a blind, unsatisfactory and somewhat dangerous proceeding, often giving poor results. In the case of a successful issue, moreover, it is impossible to be certain to what extent, if at all, the sinus was diseased.

2. The buccal route may be adopted in dealing with the maxillary antrum (Caldwell-Luc operation), and it is the method usually chosen when the lining membrane is diseased or polypoid or when caries or necrosis of the bony wall is present or is suspected.

A transantral operation may be carried out on the ethmoid, but it has certain disadvantages. Hemorrhage is liable to be troublesome, and it is not possible to deal with all the cells, especially the uppermost. Moreover, there is the technical objection to approaching the highest ethmoid

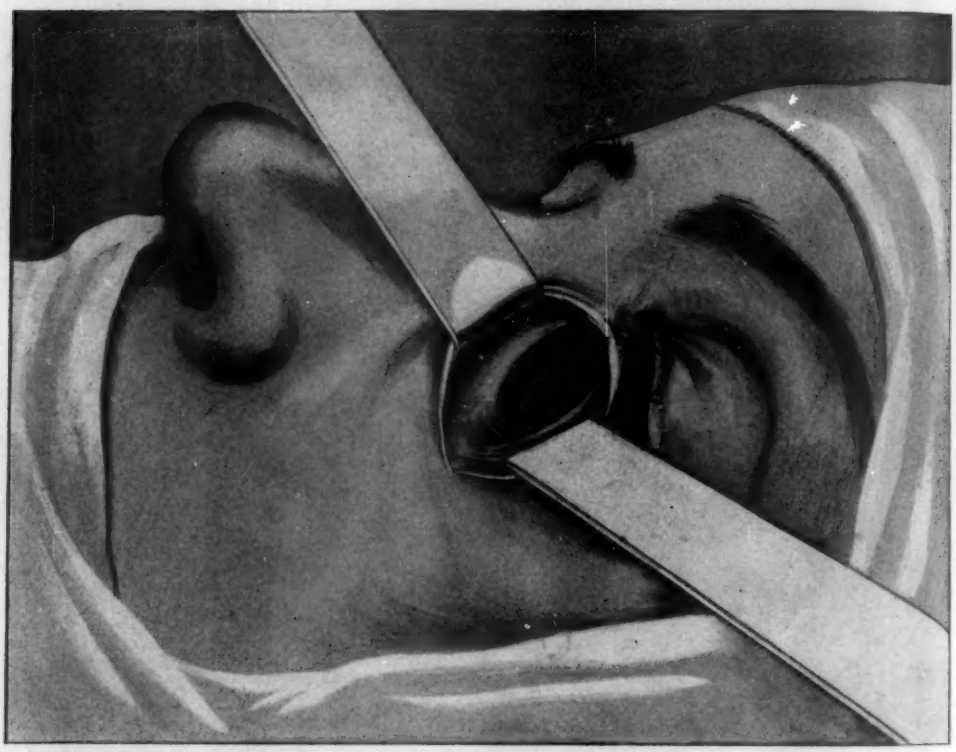

Fig. 3.—The inner margin of the orbit and the lacrimal sac. Stitch is shown in the upper end of the incision, as described in the text.

cells, situated as they are so close to the interior of the skull, through the septic cavity of the mouth.

3. In cases of well established disease of the ethmoid cells the external route has everything in its favor as compared with the other methods of approach, although, owing to age or debility, it may not be suitable for certain patients. By means of two incisions, which will presently be described, all the nasal sinuses, including the maxillary antrum, can be approached, explored and dealt with surgically.

I shall not enter into any detailed discussion on the indications for surgical intervention in cases of chronic inflammatory disease of the

nasal sinuses. This matter is somewhat controversial, there being much disparity between the views of various surgeons. Many patients can be relieved, or even cured, by very limited measures.

It would obviously be absurd to carry out a radical operation in every case of nasal polypi. Removal from time to time with the snare or with suitable forceps may be all that is required. Even cauterization with the actual cautery may be sufficient. This method is admirably suited to elderly, feeble or nervous patients or those suffering from asthma. Entire absence of bleeding is an obvious advantage. The employment of radical measures is indicated when the disease has spread to the orbit, when the soft tissues over the sinus are involved, possibly with the formation of a subperiosteal abscess or when an external fistula has developed. Radical intervention is also indicated when there is a suspicion that the inflammatory processes are spreading to or have actually

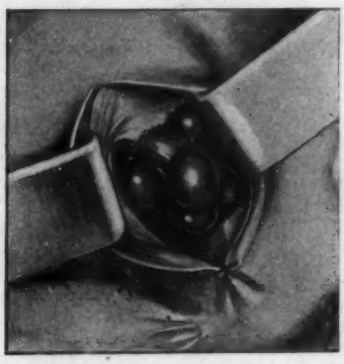

Fig. 4.—A portion of the ascending process of the superior maxilla has been removed, and polypi are visible.

involved the brain or its coverings or when there is a history of pain, severe, prolonged or recurring. This is especially likely to be the case when the frontal sinus is involved, in which case permanent relief may be secured only by radical treatment. Drastic measures may, again, be called for when there is chronic ill health or when indications of the involvement of distant organs as the result of septic absorption are present.

Occasionally an operation carried out by some other method has failed, and more thorough treatment is called for. Operative treatment by external approach is necessary in cases of large osteomas arising in the ethmoid or the frontal sinus; in such cases the condition may be complicated by suppuration. Sometimes this bony tumor penetrates into the interior of the cranium and requires the attention of the neurosurgeon.

Roentgenographic study often throws light on the anatomy and pathology of chronic sinusitis. Implicit reliance, however, must not be

placed on roentgenographic evidence, as it may not correspond to the actual condition revealed at operation.

When one is dealing with a collection of pus in any part of the body, much depends on the consistency of the walls of the so-called abscess cavity, not a very happy term since the walls which contain the purulent collection are generally capable of collapse and there is no cavity left after evacuation. In the case of an abscess surrounded by soft tissues, when the abscess is opened and drained the surrounding parts fall together, with the eventual formation of scar tissue at the site of the abscess. Abscesses situated within the cranial box or thoracic cage, after appropriate surgical treatment has been carried out, also come under this category. Conditions are entirely different when the nasal sinuses are concerned, no collapse being possible, owing to rigidity of the abscess walls.

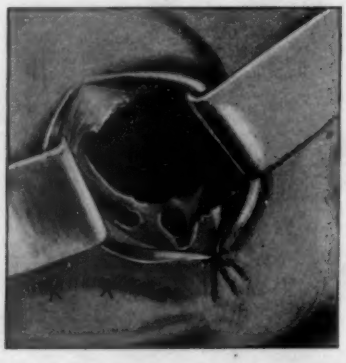

Fig. 5.—Further stage of the operation shown in figure 4, in which individual ethmoid cells are seen after removal of polypi.

These considerations have an important bearing on operative treatment. In the case of the ethmoid sinus, removal of all the inflammatory foci can generally be carried out; this virtually amounts to excision of the pus-bearing area. The frontal sinus can be drained, or it can be obliterated by removal of the anterior and inferior bony walls, together with the whole of the lining membrane. With regard to the sphenoid sinus, when no extensions occur into the wings of the sphenoid bone or the base of the pterygoid processes, much the same conditions are present, but there is a difference, since the cavity cannot be obliterated in the same way and there are no soft tissues to fall back on the walls which remain. After an extensive operation the upper and posterior walls simply lie exposed in the nasal cavity. The maxillary antrum could be excised only by removal of one-half the maxilla, an operation which has often been performed for malignant disease but is now rarely car-

ried out. Drainage, accompanied sometimes by removal of the lining membrane, represents the more radical treatment of inflammatory disease of the antrum.

It is probable that a chronic inflammatory condition in the frontal sinus is in the majority of instances associated with corresponding changes in the ethmoid cells, and treatment in such cases must be directed toward the cure of disease in both sets of sinuses. Radical measures undertaken with a view to curing the ethmoid disease may,

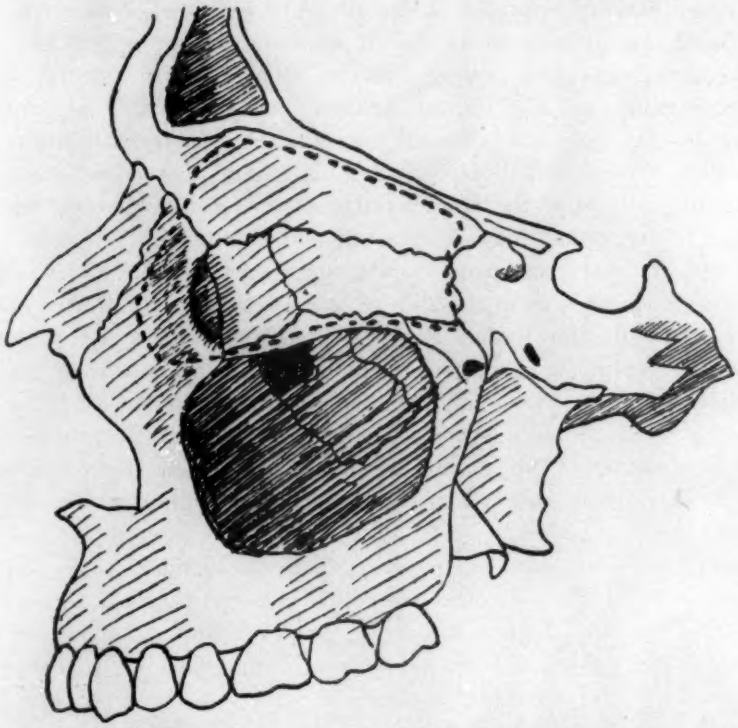

Fig. 6.—The area enclosed by the dotted line indicates the extent of the bone removed. In addition to the ethmoid region, it will be seen to include portions of the ascending process of the superior maxilla, the frontal and nearly the whole of the lacrimal bone.

by improving drainage of the frontal sinus, lead to amelioration or resolution of the condition in the latter cavity. On the other hand, radical treatment of the frontal sinus in cases in which the ethmoid galleries are also affected is not likely to have much effect on the ethmoid condition.

The initial attack should in the majority of cases be delivered on the ethmoid sinus, often to be followed at the same sitting or subsequently by surgical attention to the frontal sinus.

When the maxillary antrum is also involved it may be dealt with separately, but this cavity is so likely to act as a receptacle for pus coming from higher regions that its successful treatment may depend on the treatment of other sinuses. This statement does not as a rule apply to cases of infection of dental origin. Treatment of the sphenoid sinus may fall into the scheme of operation; indeed, all four sets of sinuses may be dealt with at the same session.

OPERATIVE TECHNIC

When external approach is thought to be indicated, I have recently employed one or both of two short incisions. They appear to meet all requirements when dealing with the ethmoid or the frontal sinus. These incisions may be termed "ethmoid" and "frontal," respectively. Through the lower, or ethmoid, incision the ethmoid labyrinth, the maxillary antrum and the sphenoid sinus can be approached and dealt with surgically, and the frontonasal duct, or even the lower regions of the frontal sinus, may be exposed and examined. The lower, or ethmoid, incision corresponds to the inner part of a furrow which is nearly always present in the skin of the cheek below the lower eyelid. This furrow is often well marked. It is also more or less in line with the lower portion of a spectacle frame should the patient wear glasses. Preliminary to operation on the ethmoid or the frontal sinus by the external route the eyelids are sewn together, so as to protect the eyeball from injury. The incision begins about ¼ inch (0.6 cm.) below the inner canthus and is carried outward and slightly downward for about 1 inch (2.5 cm.). The skin should be sliced by holding the blade of the knife parallel, not vertical, to the surface. The shelving edge so obtained allows of better approximation when the time comes to close the wound, thus leading to practical elimination of the scar (figs. 2 and 8 *B*). This incision concerns the skin and subcutaneous tissues only. By retracting its edges the fibers of the orbicularis oculi muscle are brought into view, and they can be separated along the line of the cutaneous incision by employing a blunt dissector, so that the muscle receives the minimum of injury. Bleeding by this procedure is reduced to a minimum, and the muscle fibers approximate perfectly during the final stages of the operation; moreover, there is no tendency to puckering and no interference with the action of the muscle, such as might result if its fibers were traumatized. A stitch composed of medium-sized silkworm gut is inserted just beyond the inner extremity of the wound. This allows of free retraction of the edges of the wound without the danger of a tear extending inward and upward, which might interfere with cosmetic results (fig. 3).

The periosteum is now separated from the ascending process of the superior maxilla, from the lacrimal bone and from a small portion of the adjoining orbital floor. The lacrimal duct should be defined

Fig. 7.—Roentgenogram, showing an ethmoid cell on the left side, situated between the antrum and the orbit.

and preserved from injury. If necessary, it can, at a later stage in the operation, be mobilized by removing the bony wall which surrounds it in its passage downward toward the inferior meatus. In the initial

stages of the operation it is advisable not to carry the separation of the periosteum too far backward. The mucoperiosteum lining the cavity of the nose should now be exposed by removing a portion of the ascending process of the superior maxilla; the upper and anterior part of the nasal cavity can now be entered by incising the mucoperiosteum.

During the early stages of the operation it is convenient to make use of a self-retaining retractor. Later, a similar retractor with a long blade may be employed, but a malleable copper retractor controlled by an intelligent assistant is preferable, since slight adjustments can be made from time to time during the progress of the operation. The periosteum is now further elevated from the inner wall of the orbit nearly as far as its apex, thus laying bare the orbital plate of the ethmoid bone, or lamina papyracea. Free access to the whole ethmoid labyrinth is obtained by this means. The ethmoid cells can now be systematically exposed and dealt with, together with the orbital plate of the ethmoid bone. Any ethmoid vessels met with during these procedures should, if possible, be divided between ligatures. The operation is carried backward stage by stage toward the sphenoid sinus and the apex of the orbit and upward, caution and a delicate touch being essential, toward the base of the skull, which in this region is formed by a comparatively thin plate of bone representing part of the floor of the anterior fossa (figs. 4 and 5). The operation cannot be considered radical unless the greater portion of the ethmoid bone is exenterated. Complete removal of the uppermost cells is obviously impossible, but they can be freely opened and the mucous membrane lining the roofs of the cells removed. The cribriform plate lies medial to the field of operation, and it should on no account be disturbed, as there is danger of infection passing upward around the olfactory nerves, with resulting meningitis. A pledget of moistened cotton wool held in forceps is the best and safest agent for removing remnants of mucous membrane and polypi situated in the upper regions of the ethmoid sinus. The superior and middle turbinates have often undergone disintegration as the result of disease or previous operation; if still present they should be removed. It is frequently noted that the ethmoid cells have been partially or completely replaced by polypoid tissue. In dealing with the lower region of the ethmoid labyrinth antro-orbital cells may be encountered and the maxillary antrum may be opened; indeed, it is difficult to see how a radical operation can be performed without opening this cavity (figs. 7 and 9*A*). When the operation is successfully completed, the only remaining part of the ethmoid is its roof, which in reality is formed by the frontal bone, but a small portion of the orbital plate in the region of the apex of the orbit should be left intact. On account of the proximity of the optic nerve, extreme care is necessary in dealing with this neighborhood. Orbito-

ethmoid cells may be present, and if a large cell extends outward toward the zygomatic process complete operation is not possible, unless further access is obtained by means of a frontal incision. The frontal sinus may share in the inflammatory process, and an operation on this cavity may be carried out at the same time or subsequent to that on the ethmoid.

Operations on the ethmoid sinus can be performed with greater precision and more thoroughly under magnification, and during the more critical stages, especially in dealing with the upper ethmoid cells, I find spectacles of 1⅛ magnifying power extremely useful. The field of operation should be kept as free from blood as possible by employing a suction apparatus. A small catheter passed up the nose is convenient and interferes little with vision or manipulations.

After removal of diseased tissue from the ethmoid the sphenoid sinus should be explored with a probe or syringe through its natural ostium; in the majority of cases this sinus will be found healthy. If it is diseased, enlargement of the normal opening by removal of a portion of the anterior wall will generally establish satisfactory drainage, although a more radical operation, consisting in the removal of a greater part of the anterior wall and floor, may in some cases be considered necessary, any remaining mucous membrane being at the same time removed.

Some information may be obtained through the ethmoid incision regarding the condition of the frontal sinus; pus may be observed trickling down from the sinus. A probe or cannula may be passed along the frontonasal duct or through the inner and anterior part of the floor of the sinus. By employing the method of approach to the ethmoid cells which I have described, it is possible to explore the maxillary antrum. A small portion of the upper and inner wall of this cavity, situated in the vicinity of the lower inner and anterior part of the orbit, is removed, if indeed this procedure has not already been carried out. Care is taken not to injure the lacrimal duct. (Some previous knowledge of the condition of the antrum will have been gained by roentgenographic studies and exploratory puncture.) Through this route a large antronasal opening can be assured if the whole of the antronasal wall above the attachment of the inferior turbinate is removed. The opening will not readily contract. Nature has formed the normal communication between the antrum and the nose in this region, and possibly drainage from an opening situated here is as adequate as when it is placed below the inferior turbinate. A somewhat larger opening can be established above that body than is possible in the outer wall of the inferior meatus. There is no need to remove any portion of the inferior turbinate. When the patient is lying on his back or on the side opposite the disease, drainage will be quite as free as when the opening is situated in the

Fig. 8.—Entire absence of scarring after external operations on both ethmoid cells.

position usually selected. In cases in which the cilia are still active or regeneration of the ciliated epithelium has taken place, ciliary activity probably plays a more important role than gravity in removing the products of inflammation. In some cases it may be thought advisable to remove a part or the whole of the lining membrane of the antrum, which may be thickened or show polypoid degeneration. This procedure is carried out under direct vision.

When the varying stages of the operation have been carried to completion, the fibers of the orbicularis oculi muscle are approximated by inserting a few catgut sutures. The silkworm gut suture at the inner angle of the wound is removed. The wound is closed by the insertion of fine silkworm gut or horse hair sutures, so as to bring the edges of the skin into accurate apposition. The best technic consists in inserting a suture, which is left long, at each end of the wound. Traction is applied to these two sutures so that the edges of the wound are brought together, thus allowing the remaining sutures to be inserted with great accuracy. A very fine curved needle should be employed, inserted close to the margins of the skin. The sutures uniting the eyelids are removed.

The whole area, including the eyelids, is covered with a pad of gauze, and a bandage is firmly applied. The patient is instructed not to blow his nose for ten days, and the dressing is kept in place during this period and changed when thought necessary. In the course of from twenty-four hours to four days the stitches can be removed.

The operation is performed with the patient under general anesthesia, after preliminary packing of the nose with tampons soaked with cocaine and epinephrine, or the whole procedure may be carried out with local anesthesia.

The "dead space" which results from the removal of the ethmoid cells is soon occupied by the orbital contents, which bulge into the nose. For a short time after the operation there is a tendency to formation of crusts, which should be removed from time to time; these soon tend to disappear. Before operation the olfactory sense is often blunted or lost, but it may return partially or completely, since, as the result of the removal of polypi or inflammatory swellings, olfactory particles may be able to reach the upper part of the septum, where a portion of the sense organ is situated. I do not employ a skin graft, as it appears to me that such a graft cannot form a proper substitute for normal mucous membrane. Moreover, it may lead to the accumulation of desquamated epithelium, which, instead of favoring drainage, may cause obstruction. I have made use of the technic already described for nearly four years, and the results so far as I can judge have been highly satisfactory. As a rule there is practically no disfigurement; unfortunately, owing to the war, I have lost sight of most of my early patients.

A B

Fig. 9.—A low place ethmoid mucocele. *A*, before operation; *B*, after operation. Scarring is barely visible.

OPERATIONS ON THE FRONTAL SINUS

Individual variations in the anatomy of the frontal sinus may necessitate modifications in surgical technic. The size of the sinus, especially its anteroposterior extent, is of great importance. A large, shallow sinus can be obliterated without causing much deformity.

The septum which separates the two sinuses may deviate considerably to one side, and an opening made through the anterior wall may expose the sinus of the opposite side. This will not occur if the sinus is entered through its inferior, or orbital, wall. The sinus may be partially divided. It is common to find deep bays or pockets which extend for some distance beyond the main cavity. One or both sinuses may be absent, or the cavity may be so small that it does not extend upward beyond the orbital plate. The ostium may, when well developed, measure 8 mm. in diameter or be represented by a mere slit.

Since Ogston's original operation,[1] which took place in 1884, many modifications have been introduced.

Ogston opened the sinus by employing a trephine, enlarged the frontonasal passage and passed a drainage tube into the nose. During the early period operations on the frontal sinus were frequently followed by osteomyelitis, and the mortality was high.

In carrying out external operations on the frontal sinus the incision I employ corresponds to the supraorbital ridge, passing through or lying just below the hairy eyebrow, which should not be too closely shaved before the incision is made (fig. 2). When the operation is of an exploratory nature, when it is thought that removal of the anterior wall of the sinus will not be necessary or when the sinus is shown by roentgenographic examination to be very small or shallow, the incision should be carried through the center of the eyebrow. When, however, removal of the anterior wall of a deep sinus is contemplated, the incision should be made immediately below the eyebrow. In the event of a depression following operation, an intact eyebrow is important, especially in view of subsequent plastic procedures. Under no circumstance should the incision be carried downward beyond the inner limit of the eyebrow, since a scar situated in the skin of the upper and lateral region of the nose is liable to be conspicuous. The sinus should always be explored through its inferior wall. Even a comparatively large opening can be made in this region without causing any depression. After sufficient bone is removed, the mucoperiosteum is incised with a small scalpel. In the event nothing is found the wound heals in a few days.

By means of the incision aforedescribed all necessary investigation and treatment can be carried out, even in the case of a large sinus with numerous extensions. Access to the frontonasal duct and the anterior

1. Ogston, A.: Trephining the Frontal Sinuses for Catarrhal Diseases, M. Chron. **1**:235-238, 1884.

A, before operation; *B*, after operation. Scarring is barely visible.

ethmoid cells may also be obtained by altering the axis of view. The surgeon places his head in such a position that the line of vision passes downward, backward and slightly inward. His position relative to the head of the patient is much the same as in bronchoscopy (fig. 1).

It is often difficult to decide as to the nature and extent of the operation suitable in an individual case. Anatomic and pathologic conditions revealed after the sinus has been opened and explored play a prominent part in making the decision. The severity of the disease and its duration must also be taken into account. The condition of the lining membrane and of the bony walls must be carefully investigated. Disease spreading through the posterior wall or symptoms and signs pointing to intracranial complications will call for modifications in technic.

Removal of a portion of the floor of the sinus coupled with the breaking down of some of the anterior ethmoid cells, so facilitating drainage into the nose, may be all that is necessary. Sometimes the mucous membrane should be stripped from the sinus. Such a procedure is not likely to be successful in the case of a large sinus, especially if there are numerous pocket-like extensions. Obliteration of the cavity can be accomplished by removal of the anterior and inferior walls, together with the whole of the mucous membrane covering the posterior wall. This in some cases is the only method of obtaining a cure, since when the wound is healed no cavity remains. Such a procedure in the case of a large, deep sinus will lead to considerable sinking of the forehead, not an important matter in a male patient since the depression can be subsequently remedied by plastic methods. Little deformity follows obliteration if the sinus is shallow or small. I feel convinced that the prevalence of osteomyelitis in the early days of the operation was due to the leaving of portions of bone denuded of their periosteal covering on both aspects, depriving the bone of nourishment through cutting off its vascular supply. A favorable site was thus offered for the development and spread of infection.

Little drainage will be necessary after an obliterating operation, and if an external tube is inserted it can generally be discarded in a week or ten days. In cases in which the sinus has merely been opened and drained a tube furnished with lateral openings should be inserted so that it runs right through from the external wound to the nostril. It should be changed at least once a week. Such drainage may have to be maintained for several weeks.

The author of the *Journal of Laryngology and Otology* has permitted me to reproduce illustrations which appeared in that journal (Patterson, N.: External Operations on the Frontal and Ethmoidal Sinuses, J. Laryng. & Otol. **54**:235-244 [May] 1939).

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PRACTICAL POINTS IN DIAGNOSIS AND TREATMENT OF SINUSITIS

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It has been suggested that the presentation of some practical points in the diagnosis and treatment of sinusitis, from the clinical standpoint only, might be of benefit to the young rhinologist who has just started the practice of this specialty. Wishing to learn all that he can of sinusitis, he investigates the literature, listens to the conversation of the older men, observes operations and studies end results. If his is a mind able to think things through, to discard the bad and adopt the good, he will be among those leaders of his profession who in each generation carry the torch forward. Many, however, sink in the quagmire presented by the literature alone. For example, two articles by physicians of equal repute, each fully convinced that his, and his alone, is the best method of diagnosis and treatment, differ from each other at every step. The same case histories, at first glance so convincing, are often used to back up opposing opinions. There is a considerable amount of material on sinusitis; many scientific investigations have been reported and many papers written on the diagnosis, treatment and results obtained. Opinions expressed in the literature run the gamut from the theory of "Do nothing" to that of "Always operate."

What, then, is the young rhinologist to believe? Shall he choose the easiest way, leaving all to Nature or to packs of mild protein silver? This course must lead to careless work, obviating as it does the necessity of determining the nature and extent of the existing lesion. Shall he stick to the methods in which he was trained or try to discover other, and possibly better, ones?

Perhaps more can be learned by listening to the conversation of his elders? Alas, when two or three rhinologists from different parts of the country are gathered together, they speak in diverse tongues. On the currently important subject of chemotherapy, for example, one man will warn against the masking effects of the sulfonamide drugs and state emphatically that they should be used only when dangerous symptoms develop, at the same time admitting their value for just such complications. Another points out that the early use of these drugs, when properly given, will almost always prevent the occurrence of

Read at the meeting of the American Laryngological, Rhinological and Otological Society, Inc., Atlantic City, N. J., June 1, 1942.

complications. Will the neophyte be wise enough to reconcile these apparent contradictions, to realize the danger of masked symptoms, to watch carefully for possible failure of the drug, but to use it, knowing it to be a most valuable addition to his armamentarium?

In his endeavor to evaluate the different methods, observations, treatments and end results reported in the literature, the young rhinologist must bear in mind a number of contributing factors:

1. The geographic location, since infections act very differently in different parts of the country.

2. The type of practice (institutional, clinic or private).

3. The reputation of the author. Is he mightier with the pen than with the scalpel? What is his technic in handling situations? For example, he may state flatly that inflation of the ear is of little value. Does he know how to inflate an ear? If he does, his statement is worth careful consideration; if not, it is worthless. The same thing holds true in all nasal treatment; the skill and dexterity of the operator play a great part in the success or failure of any given procedure.

4. The author's criterion of success and the measuring rod with which he approaches his work. Definitions vary; what one man calls chronic is not so regarded by another, and ideas as to what constitutes a cure differ widely. A claims that a window operation will cure a chronic condition of the antrum, while B insists that a Caldwell-Luc operation is necessary. It may well be that A operates at a much earlier stage than B. The question arises: Does A operate prematurely, or does B wait until the condition is so serious that only a Caldwell-Luc operation can cure it? C considers a window operation a success only when the patient ceases to have symptoms from the antrum; D is content to call it a cure as long as there remains an opening through which polypi and diseased tissue may be removed at need. E says a window operation is all that is necessary; F asks, "Why bother with a window?"

Perhaps a trip to the operating room to observe the actual work of each surgeon will help to solve the young man's perplexity. But here he may find that X is satisfied to use a rasp, taking but a few minutes to make a window, which, of course, promptly closes. Although X considers the operation has attained the desired result, many will disagree with him, and rightly so. Y, on the other hand, makes as large a window as the inferior meatus will permit, requiring perhaps an hour for the operation, but he then turns down a large turbinate, completely closing the window so carefully made. Z, when confronted with a turbinate which impinges on the nasal floor, trims off a little of the inferior border of this obstructing structure in order to afford aeration and drainage to the antrum. Despite instructions never to interfere with a turbinate, this seems the more sensible procedure. In my

experience, the two procedures which obtain the most gratifying results are: (1) trimming a little of the inferior border of the inferior turbinate, when it impinges on the floor of the nose, and (2) fracturing the middle turbinate inward when indicated.

EVALUATION OF PROCEDURES

Caldwell-Luc Operation.—I agree with those who feel that the window operation should be reserved for cases in which annoying local symptoms are present and the roentgenogram does not show too much involvement of the lining membrane. At least, in such cases, a window operation should be tried first. If there are decided constitutional or tracheobronchial symptoms, together with pronounced roentgenographic evidence, the operation of choice is the Caldwell-Luc procedure, plus removal of the ethmoid cells if these are diseased and an opening into the sphenoid sinus when necessary. It must be borne in mind that roentgenograms taken before and after a simple Caldwell-Luc operation frequently demonstrate that cloudy ethmoid, sphenoid and frontal sinuses undergo remarkable postoperative improvement. For this reason, macroscopic evidence of local disease would seem advisable before operation on the ethmoid cells themselves is considered. Again, since in the great majority of cases the Caldwell-Luc operation is indicated only when the entire membrane of the antrum shows microscopic evidence of disease, there can be no question as to the advisability of removing the entire membrane. Positive identification of normal membrane with the naked eye is extremely difficult. The object is complete cure. If any diseased membrane is left, it is likely to prove the source of future trouble; if any "healthy-looking" membrane is left, what good can it accomplish? Indeed, if there is any normal membrane present, the chances are that a Caldwell-Luc operation was not indicated.

The important practical points in a Caldwell-Luc operation, with the object of obliterating the antrum cavity, are as follows:

1. Remove every vestige of antral membrane. This cannot be successfully accomplished without the aid of mirrors; their value in disclosing hidden bits of membrane cannot be overemphasized. If mirrors are not used, much diseased membrane will be left, and the end results will compare unfavorably with those in which it is thoroughly removed.

2. Make as large an opening as possible into the inferior meatus.

3. With an instrument, possibly a suction tip, in one hand, through the nose push the inferior turbinate partly into the antrum through the newly made window; then, with a biting forceps in the other hand, remove through the antrum enough of the inferior border of the inferior turbinate in the central portion to leave a free opening from the antrum into the nose. If too small an amount of turbinate is removed, the remainder will heal to the opening of the antrum, producing a cavity.

4. If the ethmoid cells show macroscopic evidence of disease, remove them through the antrum.

5. Pack the opening into the inferior meatus with gauze; do not pack the antrum.

6. Remove the gauze by degrees during the next five days, thus producing some bleeding and thereby adding to the clot in the antrum.

7. Do not irrigate; use dry agents only in after-treatment.

8. Dust sulfanilamide powder into the nose and antrum cavity.

The final result of this procedure should be the obliteration of the antral cavity by the fibrous tissue spreading out through the clot which forms in the antrum. If all the membrane has been removed, no abscesses can possibly form in the fibrous tissue which replaces it. Anterior examination of the nose should show a normal-appearing inferior turbinate, the function of which has been left undisturbed. The

TABLE 1.—*Series of Seventy-Nine Caldwell-Luc Operations* *

Organism	From the Nose	From the Tissue
Staphylococcus albus	42	19
Staphylococcus aureus	21	7
Streptococcus viridans	15	50
Streptococcus haemolyticus	5	7
Pneumococcus type XIX	1	1
Friedländer's bacillus	3	1

* Cultures of material from the nasal mucosa taken just prior to operation differed from cultures of antral tissue removed at operation in 52, or 65 per cent, of the cases.

nasopharyngoscope should reveal a part of the middle portion of the turbinate missing and a solid wall replacing the former cavity.

Vaccine Treatment.—There is considerable divergence of opinion on the vaccine treatment of sinusitis. Some have found it helpful, but in my own experience it has not been very satisfactory. At St. Luke's Hospital, New York, my associates and I have recently made a practice of taking material for culture from the nasal mucosa just prior to every Caldwell-Luc operation and sending it, together with cultures of the diseased antral tissue, to the laboratory for examination. In 52 (65 per cent) of a series of 79 cases, the results of nasal culture differed from those of the culture of the antral tissue. In other words, over half the cultures of material from the nose did not show the true organisms responsible for the sinus infection. The organism most frequently found in the nasal cultures was Staphylococcus (albus or aureus), while the predominating organism in the antral tissue was Streptococcus viridans. These results, although covering a comparatively small number of cases, certainly indicate that an autogenous vaccine may be highly unreliable.

Irrigation.—Authorities differ radically on the question of irrigation of the antrum through the middle meatus. Some consider it a practical, useful procedure, far superior to puncture through the inferior meatus. On the contrary, Skillern stated that cannulization through the natural ostium is not practical, and Schaeffer asserted that it is impossible in the vast majority of cases. The beginner would be unlikely to attempt an "impossible" or "impractical" procedure, especially if he tried it and found it difficult.

Van Alyea, in an excellent recent book [1] on the nasal sinuses, stated that "anatomical findings conform largely with those made by other observers and in doing so fail to justify the reports of clinicians who practice catheterization of the ostium maxillaris." Close examination of this statement shows that the anatomist is reporting on a certain number of skulls (which may or may not have been diseased), whereas the clinician who advocates catheterization is reporting only on diseased conditions in vivo. Anatomists have found only 54.6 per cent of large openings in the middle meatus; yet my records show that in a series of 1,223 primary irrigations through the middle meatus, 65 per cent of the openings encountered were large.[2] My definition of a large opening is one through which a catheter can be passed without the slightest pressure and apparently without encountering the slightest resistance. No distinction is made between natural and accessory openings. In this connection, it should be noted that Van Alyea stated: "In many cases the lower border of the turbinates was on a level with and above the ostium; these were usually regarded as easy to catheterize." I have found many large, easily catheterized openings located underneath the middle turbinate, a fact which might help to account for the higher clinical percentage. The difference between the clinician's figure of 65 per cent and the anatomist's figure of 54.6 per cent may be due to the fact that disease has produced some large openings and that antrums with large openings are more frequently involved; probably the cause is a combination of the two factors. There can be no doubt that disease increases the percentage of large openings, and it seems equally possible that a large natural or accessory opening renders the antrum more susceptible to infection. There are three points to be considered: 1. It would seem that a small opening affords much better protection against infection, since secretion can enter less readily. 2. One is dealing with a cavity in which positive and negative pressures are produced during

1. Van Alyea, O. E.: Nasal Sinuses: An Anatomic and Clinical Consideration, Baltimore, Williams & Wilkins Company, 1942.

2. Bowers, W. C.: Lavage of the Antrum with a Blunt Instrument Through the Middle Meatus (A Series of 2,580 Cases), Ann. Otol., Rhin. & Laryng. **49**:1036-1037, 1940.

respiration. Proetz [3] has stated: "As the ostium narrows a progressively increasing time lag occurs in the fluctuations of pressure within the sinus." Might it not be possible that there is a greater cleaning effect because of this time lag, and hence less likelihood of infection when the opening is small? 3. My own experience indicates that 65 per cent of cannulizations of the antrum through the middle meatus can be effected without any sensation of resistance and without bleeding or evidence of blood in the washing, an observation which should surely establish the fact that the procedure is neither impossible nor impractical. Since the evidence points to the possibility that artificial openings are caused by disease and that antrums with large openings are more frequently infected, the clinician's findings need not coincide with those of the anatomist.

As I [4] have said elsewhere:

> My personal experience has led me to believe that the antrum is the keystone to most nasal pathology and the best point of attack. In a cross section of 1,000 case histories, 36 per cent of the nasal symptoms were found due to causes other than sinus infection, 64 per cent to sinus infection. In those due to sinus infection, 96 per cent were due to involvement of the antrum either alone or in combination with one or more of the other sinuses. From these statistics, the importance of the antra as retainers of nasal infection appears self-evident. Granting this, it is also evident that if an acute antral infection is prevented from becoming chronic there will be far less involvement of the other sinuses through extension of infection.

TABLE 2.—*Size of Antral Openings in the Middle Meatus as Recorded in 1,223 Case Histories*

	Percentage
Opening large (entered without any sensation of resistance)	65
Size not noted (probably half of these were large, as in my early records no note was made unless the opening was unusual)	6
Opening slightly tight (this means a dimple was felt with the catheter, and the antrum was entered with slight pressure)	28
Opening very tight (puncture through bone)	1

Certainly one of the best methods of attacking infection (in the antrum) is through irrigation.

It has been claimed that irrigation through the middle meatus is dangerous. In reply, one may examine the records of 2,580 cases of primary irrigation.[2] In some of these cases only two or three washings were required, but in most of them four or five were needed; in some in which the condition was chronic and tended to recur there were

3. Proetz, A. W.: Essays on the Applied Physiology of the Nose, St. Louis, Annals Publishing Company, 1941.

4. Bowers, W. C.: Infections of the Middle Ear and Nasal Sinuses, Bull. New York Acad. Med. **17**:453-462, 1941.

many irrigations. For a conservative estimate, these 2,580 primary irrigations may be multiplied by 4, making a total of 10,320 antral washings through the normal (or accessory) opening. Of this entire number, there has not been a single instance of embolism, osteomyelitis or emphysema. This could hardly have been the case had much trauma been produced or had the middle meatus been a dangerous place through which to irrigate.

The complaint is sometimes made that the catheter so fills the opening as to prevent a return flow. In all my experience there have been not more than 25 cases in which it was impossible to evacuate the secretion by return flow; this included both cases of middle meatal washings and cases of puncture through the inferior meatus. Sometimes when the secretion could not be obtained through the middle meatus, puncture through the inferior meatus was tried, with no better result. In such cases failure to establish a return flow would seem to be due to extreme swelling of the mucous membrane rather than to plugging of the opening by the catheter and would certainly indicate that washing of the antrum be abandoned for a while. Again, in irrigating an antrum through a tight opening, I have frequently been amazed at the thickness of the secretion obtained, indicating that if I had not found the large opening the secretion had. It is quite possible to overlook the large opening; on the charts the original note may be, "Opening tight," while a later record often reads, "Opening large." In a recent case the original note read, "Opening not readily found"; yet on a subsequent occasion the catheter entered easily a large opening in each antrum, placed very low, almost on top of the inferior turbinate.

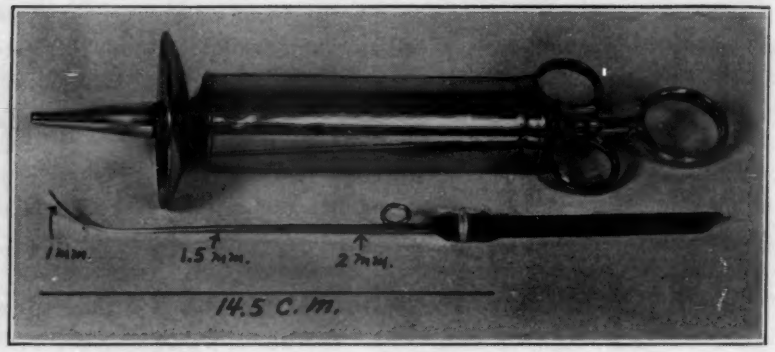
There is, of course, a type of chronic infection in which the antrum is so diseased that no amount of washing will clean it.

The statement is sometimes made that trauma is produced by washing through the middle meatus and that the natural opening will be made smaller by adhesions, thus possibly impairing drainage not only of the antrum but of the frontal and ethmoid areas. Yet on washing many antrums years after the original irrigation, the opening has been found exactly as described in the original note. It has been more usual in the later washings to find a large opening than one which is tighter, indicating that increasing skill adds to the likelihood of finding the large opening. In over 2,500 cases there was no evidence of any damage to drainage from other sinuses. It must be emphasized that these structures can be damaged. Trauma should never be produced; if a large opening is not found by quick gentle search or puncture with gentle pressure is not made within a minute or two, attempts to wash that particular antrum through the middle meatus should be abandoned.

It is repeatedly stated that an antrum should never be washed in the presence of an acute infection; that depends on the definition of

acute. Some elderly patients have chronically diseased antrums provided with large openings which can be irrigated without trauma. If such antrums are irrigated at the first appearance of a "cold," sore throat or tracheitis, the symptoms will frequently disappear with amazing rapidity.

The words "impractical" and "impossible" are used so often in connection with irrigation through the middle meatus that I have wondered whether the difficulty may not be due to the instrument used. There are a number of excellent instruments on the market, but they often become so distorted by the manufacturers that they are scarcely recognizable. It may be helpful to describe in detail the one I have found most useful; I have employed it seventeen years. This catheter has a blunt point, which enables it to slide over a surface without trauma. Its flexibility makes it impossible to exert much pressure without



Catheter used in irrigation of the antrum or other sinuses.

bending it. It can be bent into any desired angle, so that it may be used for a frontal or a sphenoid sinus, as well as for the antrum.

Chemotherapy.—The development of chemotherapy may change many present ideas and radically alter present methods of treating sinus infection, but it is to be hoped that the younger men will not become so dependent on it as to neglect other reliable methods. The sulfonamide drugs, as they are known today, are marvelously effective in clearing up acute fulminating sinusitis, but I have yet to see them permanently cure a chronic condition with a badly diseased membrane. The time may come when one will never have to irrigate an acutely or a subacutely infected sinus, but for a time at least one will certainly continue to irrigate in cases of chronic sinusitis.

As to the various forms of the drug in present use (May 1942), irrigation with a freshly made 5 per cent solution of sulfathiazole (2-[paraaminobenzenesulfonamido]-thiazole) gives excellent results with

chronic sinusitis, although there is some question as to its irritating qualities. In 1 case, with broken-down pus in an antrum, in which operation seemed inevitable and repeated washings produced no improvement, the infection cleared up completely after three irrigations with this solution, given two days apart. The chances are, however, that it will sooner or later recur. Sulfanilamide powder, blown into the nose, seems to be effective for a beginning cold or a purulent nasal condition. Sulfadiazine (2-[paraaminobenzenesulfonamido]-pyrimidine) has been heralded as surpassing all other forms of the drug and does seem to be the best tolerated, but I have found it the most irritating to the kidneys, and it also has a depressing effect on the leukocytes and polymorphonuclear cells. The whole picture of chemotherapy may change overnight. At present it is believed that one should give the drug early, watch carefully for possible masking and at the same time drain any focal infection.

SUMMARY

In conclusion, my advice to the young rhinologist is: Study all the methods of treating sinusitis; note the advantages and disadvantages of each, and learn to adapt each one to the individual patient. What is ideal for one will prove inadvisable for another. Do not be too easily discouraged by adverse or contradictory reports. One patient differs from another as widely as one treatment from another; individual treatments vary as greatly as individual nasal structures. Remembering that both the case history and the type of patient have a bearing on the situation, the rhinologist must learn to select the most satisfactory type of treatment for the case at hand. No part of the anatomy is less understood by the general practitioner than the nose, and little time is spent by the rhinologist in explaining to him or to the patient the results to be expected from any given procedure. Frequently a bad choice of operation is made. All this leads to misunderstandings. The rhinologist should explain to the patient the different methods used in treating certain conditions and just what results may be expected from each. He should be careful in his choice of operation, never overlooking the possibility of allergic susceptibility and fit his treatment to the temperament and individual reactions with which he has to deal.

There is a little prayer—author unknown—which might be paraphrased slightly to fill this young man's needs: "O Lord, give me serenity to leave alone what should be undisturbed, courage to do what should be done and wisdom to know one from the other."

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VALUE OF FATTY ACID DERIVATIVES IN TREATMENT OF CHRONIC OBSTRUCTIVE RHINITIS

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Treatment of the chronic obstructive forms of rhinitis has been unsatisfactory in many cases, as is shown by the various preparations used and the methods of treatment instituted. Failure and success have been acclaimed in these cases. Since several factors play an important role in the cause and cure of the obstruction, it is difficult to evaluate the various methods of treatment. The purpose of this study is (1) to establish a definite criterion for choosing patients who will respond favorably to submucosal injection of the fatty acid derivatives—sodium morrhuate, sylnasol[1] and monoethanolamine oleate; (2) to determine the effect of these preparations on the nasal mucosa soon after the termination of treatment; (3) to determine the condition of the mucosa at a relatively long interval after the completion of the treatment; (4) to determine the permanence of the benefit which can be expected from these preparations, and (5) to make a comparative microscopic study of the nasal mucosa of the patients and a clinical evaluation of the three preparations used.

Many synonymous and overlapping terms have been used by various authors in the classification of the chronic obstructive forms of rhinitis. This has led to confusion in the nomenclature. A simple classification is herewith submitted under which all the forms of chronic obstructive rhinitis may be grouped. I have found this grouping to be practical in serving as a guide for treatment.

CLASSIFICATION OF CHRONIC OBSTRUCTIVE RHINITIS

1. Chronic obstructive rhinitis due to anatomic abnormalities.
2. Chronic obstructive rhinitis due to specific diseases.
3. Allergic rhinitis.
4. Chronic obstructive rhinitis in which the mucosa does not shrink well with astringents and which does not belong in group 1, 2 or 3.

Read at the staff meeting of the Eye, Ear, Nose and Throat Hospital, New Orleans, April 1, 1941.

1. Sylnasol, formerly known as sylasol, is a 5 per cent solution of the sodium salts of certain of the fatty acids of the oil extracted from a seed of the psyllium group.

5. Chronic obstructive rhinitis in which the mucosa shrinks well with astringents and which does not belong in group 1, 2 or 3.

Chronic nasal obstruction may be the result of anatomic abnormalities of the septum or the bony framework of the turbinates or of such tumors as hypertrophied adenoid tissue, polyps, papillomas or malignant growths. The correction of such conditions requires appropriate treatment by surgical means or with radium or roentgen rays. Chronic obstructive forms of rhinitis due to specific diseases, such as syphilis and tuberculosis, are not as rare as one would suspect, particularly among dispensary patients. The treatment in such cases should be focused on the primary disease, with local therapy. Obstruction from engorged turbinates is commonly associated with infection of the sinuses. Patients with true allergic rhinitis should be treated by desensitization or removal of the allergin, if possible. Although some allergic patients have responded well, it has not been determined whether or not many of this group are amenable to the sclerosing therapy, since patients with true allergic rhinitis are treated in the allergy clinic of this institution. The chronic obstructive rhinitis in which the mucosa fails to shrink well with ephedrine or other vasoconstrictor drugs, such as the hyperplastic form, will not respond satisfactorily to the submucosal injection of sclerosing solutions. The chronic obstructive rhinitis in which the mucosa shrinks well with astringents and is not a member of the allergic or the specific group has been treated by many preparations and methods; these have been reviewed and summarized in previous publications.[2]

PREVIOUS EXPERIENCE WITH FATTY ACID DERIVATIVES AS SCLEROSING AGENTS

Fatty acid preparations have almost entirely supplanted other, and inferior, sclerosing agents in the injection method of treating varicosities, hernias, hemorrhoids and hydroceles. The excellent results obtained by the use of these fatty acid derivatives in the treatment of the aforementioned conditions have prompted me to employ them in this investigation on the treatment of chronic forms of obstructive rhinitis in which the mucosa shrinks well with astringents and which do not belong to groups 1, 2 or 3 of the foregoing classification. Fishof [3]

2 (*a*) Thacker, E. A., and Hauser, G. H.: Sodium Morrhuate Therapy for Chronic Simple, Vasomotor and Hypertrophic Forms of Rhinitis, Arch. Otolaryng. **33**:600 (April) 1941. (*b*) Thacker, E. A.: The Treatment of Chronic Obstructive Rhinitis with Submucosal Injections of Sodium Psylliate, Ann. Otol., Rhin. & Laryng. **49**:939 (Dec.) 1940.

3. Fishof, F. E.: The Treatment of Vasomotor Rhinitis and Allied Conditions with Sodium Morrhuate, Arch. Otolaryng. **27**:413 (April) 1938.

reported 7 cases in which treatment by submucosal injection of sodium morrhuate was successful. Thacker and Hauser [2a] published the results in 58 cases in which marked benefit or cure was effected with this form of therapy. I have also obtained excellent results with sylnasol.[2b] The final conclusions regarding the use of these fatty acid preparations, together with those concerning the employment of monoethanolamine oleate, are included in this final report.

Sodium Morrhuate.—Sodium morrhuate is a mixture of sodium salts of animal fatty acids, obtained from cod liver oil. It is used in a 5 per cent solution with 2 per cent benzyl alcohol. Although good sclerosis is obtained with this preparation, with minimal danger of sloughing, a few undesirable effects, in the nature of an allergic, or sensitivity, reaction, have been reported from its use. Zimmerman [4] described 11 cases of a mild erythematous reaction to injection of sodium morrhuate for varicose veins. Praver and Becker [5] stated that in 3 per cent of their cases in which this preparation was used mild cutaneous eruptions and nitritoid crises were produced. Lewis [6] reported a case of severe anaphylaxis in which injections had been given one year prior to the one which produced the reaction. Traub and Swarts [7] had 2 cases in which weakness, dizziness, projectile vomiting, deep coma and cardiovascular collapse developed. In each case injections had been given three months prior to the one which caused the severe reaction. Neither patient gave a history of allergy. Untoward generalized reactions, including gastrointestinal upsets, are common with sodium morrhuate, according to Schmier.[8] In 1 case a pruritic rash developed over the body, with exfoliation. One month later the injection was repeated, with subsequent recurrence of the rash. McCastor and McCastor,[9] Dale,[10] Sim-

4. Zimmerman, L. M.: Allergic-Like Reactions from Sodium Morrhuate in Obliterating Varicose Veins, J. A. M. A. **102**:1216 (April 14) 1934.

5. Praver, L. L., and Becker, S. W.: Sensitization Phenomena Following Use of Sodium Morrhuate for Clinical Obliteration of Varicose Veins, J. A. M. A. **104**:947 (March 23) 1935.

6. Lewis, K.: Anaphylaxis Due to Sodium Morrhuate, J. A. M. A. **107**: 1298 (Oct. 17) 1936.

7. Traub, E. F., and Swarts, W. B., Jr.: Collapse Complicating Varicose Vein Injection of Sodium Morrhuate, New York State J. Med. **37**:1506 (Sept. 1) 1937.

8. Schmier, A. A.: Chemical Comparison or Sclerosing Solutions in The Treatment of Varicose Veins, Am. J. Surg. **36**:389 (April) 1937.

9. McCastor, J. T. N., and McCastor, M. C.: Reaction of Sodium Morrhuate Injections for Varicose Veins and Hydrocele, J. A. M. A. **109**:1799 (Nov. 27) 1937.

10. Dale, M. L.: Reaction Due to Injection of Sodium Morrhuate, J. A. M. A. **108**:718 (Feb. 27) 1937.

mons,[11] Holland,[12] Golden and Hyerdale [13] and Dobson [14] each reported 1 or 2 cases in which allergic manifestations developed either as a generalized or as a systemic reaction or in the form of dermatitis.

Sylnasol.—This substance is another mild soap of a fatty acid.[1] In an earlier study,[2b] a review of the literature revealed excellent results with the use of this preparation in the various conditions in which a sclerosing agent was indicated. No sloughing or other undesirable reaction was noted when the sylnasol was injected into the muscle, subcutaneous tissue, joint or vein. There has been no report, so far, of an allergic reaction to this drug during the five years in which it has been available for use.

Monoethanolamine Oleate.—The third fatty acid derivative, monoethanolamine oleate, used in this investigation is a synthetic compound made from olive oil. The preparation used contains 5 per cent monoethanolamine oleate and 2 per cent benzyl alcohol in an aqueous solution. Meyer [15] made 345 injections with no ill results, such as sloughing or an allergic reaction, and stated that the solution is dependable because of its standard composition. Glasser [16] stated that this agent produces excellent sclerosis in varicose veins. No sloughing, allergic reaction or other ill effect occurred in the course of 550 injections. A few undesirable ractions have been reported from the use of monoethanolamine oleate. Shelley [17] attributed 1 death to its use. The patient had received a series of injections of sodium morrhuate four months previously. Two injections of monoethanolamine oleate were made, with no untoward reaction. During the third week of treatment 4 cc. was again injected and ten minutes later the patient fainted, had convulsions and died. Autopsy revealed nothing abnormal but visceral congestion. Golden and Heyerdale [13] reported the case of a patient who experienced some degree of reaction. This patient had also earlier presented a greater reaction than normal

11. Simmons, N. J.: Anaphylaxis to Sodium Morrhuate Following Injection of Internal Hemorrhoids, New England J. Med. **218**:527 (March 24) 1938.

12. Holland, G. A.: Reaction from Sodium Morrhuate in Sclerosing of Varicose Veins, Canad. M. A. J. **41**:262 (Sept.) 1939.

13. Golden, R. F., and Heyerdale, W. W.: Sensitivity to Sodium Morrhuate and Monoethanolamine Oleate (Monolate), Proc. Staff Meet., Mayo Clin. **15**: 436 (July 10) 1940.

14. Dobson, L.: Sodium Morrhuate Reactions: Report of Two Severe Reactions During Injection of Varicose Veins, Ann. Surg. **111**:645 (April) 1940.

15. Meyer, N. E.: Monoethanolamine Oleate, Am. J. Surg. **40**:628 (June) 1938.

16. Glasser, S. T.: A New Sclerosing Drug for Varicose Veins—Monolate, Am. J. Surg. **39**:120 (Jan.) 1938.

17. Shelley, H. J.: Allergic Manifestations with Injection Treatment of Varicose Veins, J. A. M. A. **112**:1792 (May 6) 1939.

to sodium morrhuate. In a case of Cogswell and Thomas [18] the patient experienced generalized urticarcia and cyanosis, which was relieved by epinephrine. This person had received an injection of the same preparation three months previously with no ill effects. Notwithstanding this reaction, these authors have continued the use of monoethanolamine oleate.

EXAMINATION

It is important to take a thorough history, with particular attention to disease of the sinuses, anatomic deformities and definite seasonal allergy. Physical examination of the nose should be made, including transillumination and roentgenographic study of the sinuses, if indicated. Ocular disorders as a source of headaches and associated symptoms must not be overlooked. The physician must also bear in mind that other disorders and diseases of the body may cause nasal obstruction, headache and other symptoms referable to the head.

Indications for Treatment.—Indications for treatment with these sclerosing agents are:

1. Intermittent nasal obstruction of long duration, especially when it is associated with changes in temperature and humidity.

2. Chronic nasal obstruction from engorged turbinates which have failed to respond to the usual therapeutic measures after one or two months' trial.

3. Postnasal dripping, chronic pharyngitis, headache and neuralgic pains in the head and neck, in which intumescence of the turbinates exists and is causing pressure on the lateral nasal wall or on the septum.

4. Chronic sinusitis in which there remain after treatment symptoms of nasal congestion due to engorged turbinates.

5. Good shrinkage of the turbinates with astringents. This factor is important.

Contraindications to Treatment with Sclerosing Agents.—Conditions which contraindicate such therapy are:

1. Chronic systemic disease, such as arteriosclerosis, hypertensive or other types of advanced cardiac disease, nephritis and specific diseases in which proper treatment of the primary cause should improve the symptoms referable to the head.

2. Anatomic defects of the nasal passages. Injection into the chronically congested turbinates after the deformity has been corrected may be considered if the symptoms persist.

3. Hyperplastic rhinitis. In this condition the tissues do not shrink well with astringents. The patient will not respond well to the injection

18. Cogswell, H. D., and Thomas, C. A.: Report of Severe Reactions Following Use of Monolate as Sclerosing Agent, Southwestern Med. **24**:408 (Dec.) 1940.

method of treatment because of the increased cellular elements of the turbinates. In fact, treatment would only increase the already existing hyperplasia.

4. Definite allergy, with nasal manifestations which can be relieved by desensitization or removal of the allergin.

5. Acute infections of the nose, throat and paranasal sinuses.

TECHNIC OF SUBMUCOSAL INJECTIONS

The technic of administration of these three sclerosing agents is essentially the same as that described in previous publications.[2]

1. Two tampons saturated with an anesthetic are placed around the turbinate.

2. A long no. 22 needle, such as that used for spinal puncture, and a tuberculin syringe are excellent for injection into the inferior turbinate. A long gold needle is advantageous for injection into the middle turbinate; because of its flexibility, the curvature may be varied according to the particular turbinate.

3. Only a small amount of the sclerosing agent should be administered in the first injection or if several weeks have elapsed since an injection has been made. The usual dose of 0.25 to 0.5 cc. of the fatty acid solution is drawn into the syringe. This can be varied according to the estimated amount necessary in the individual case.

4. The tampons are removed. The bevel of the needle is turned away from the bony framework of the turbinate. The anterior portion of the mucous membrane is pierced, and the needle is inserted toward the posterior end of the turbinate. The sclerosing solution is liberated as the needle is gradually withdrawn. If the physician wishes, the direction of the needle can be changed and the solution dispersed in other directions without removing it. As the turbinate bleeds freely from the needle puncture, it is better to inject in different directions within the turbinate without completely withdrawing the needle. Injection into the middle turbinate is not as easy, and it may be necessary to make more than one injection at different points on the medial and lateral surfaces of the dependent border in order to obtain satisfactory results.

5. A pledget of cotton placed within the nose will readily control the bleeding from the needle puncture.

6. The cotton is removed in five minutes, and a tampon saturated with an astringent is placed around the turbinate for ten minutes.

7. The patient is advised to use a 1 per cent solution of ephedrine sulfate or 0.5 per cent solution of neo-synephrin hydrochloride every two hours for five days.

8. Injection into one side of the nose only is made at a sitting. After one week the other side may be treated.

9. Two or three weeks should elapse before another injection is made into the same tissue.

Although several anesthetics have been tried in topical applications to the nasal mucosa, I have come to the conclusion that it is advisable to use one which does not shrink the turbinates. The sclerosing agent is thereby given a better chance to disseminate throughout the submucosal tissue. It is also much easier to make the injection, with corresponding less chance of losing the preparation in the nasal cavity because of accidental perforation of the mucosa. A 2 per cent solution of butyn sulfate serves this purpose admirably. Rarely, a 4 per cent solution was employed when cocaine had been used several times previously. The butyn produced good anesthesia, with no evidence of hypersensitivity to the drug. In 2 cases toxic manifestations had previously deveioped when cocaine had been applied. There was practically no shrinkage following insertion of the butyn tampons. A 2 per cent solution of pontocaine hydrochloride produces rather rapid anesthesia, with little shrinkage and no untoward reactions. It can be used effectively as an anesthetic for the injection of the sclerosing agents. Larocaine hydrochloride (1-*p*-aminobenzoyl-2, 2-dimethyl-3-diethylaminopropanol hydrochloride) is a slower-acting anesthetic and produces some shrinkage of the turbinates. A 10 per cent solution was used, and the shrinkage which occurred was usually not enough to interfere with the injection. A 2 or 4 per cent solution of intracaine hydrochloride (betadiethylaminoethyl-p-ethoxybenzoate hydrochloride) applied topically to the nasal mucosa did not produce satisfactory anesthesia for the submucosal injections of the sclerosing preparations. None of the patients showed any evidence of sensitivity to these anesthetics. The use of cocaine has been discontinued because of its pronounced astringent action and the danger of toxic reactions.

The application of ephedrine or neo-synephrin tampons following the injection further augments the distribution of the sclerosing substance. The use of an astringent in drops or as a spray every two hours for about five days not only affords the patient relief but probably aids in keeping the vascular and tissue spaces more or less collapsed until the therapeutic effect is fairly well established.

The odor of cod liver oil and a slight burning sensation are noticed by the patient if any of the sodium morrhuate accidentally escapes into the nasopharynx or the nasal cavity. Some patients object to this fish oil scent. However, no untoward effects have been observed from the small amount which occasionally escapes onto the mucosa. If the patient complains of the "taste" or burning, this can be

relieved immediately by spraying the nose with physiologic solution of sodium chloride or an ephedrine solution. There is a slight burning sensation in the nasopharynx for a few minutes only if the sylnasol or the monoethanolamine oleate accidentally escapes during the injection. The patients have not mentioned any disagreeable odor, and no deleterious effects on the mucous membrane have been discovered with these two preparations.

CLINICAL EFFECTS

Over 300 injections of sodium morrhuate at varying intervals were made during this investigation. Two patients showed evidence of sensitivity. In both these persons papuloerythematous dermatitis developed across the bridge of the nose and the adjacent portion of the cheeks and the midfrontal regions after the injection of 0.5 cc. of the solution. Patient 64 (L. D.) had received 6 injections three months prior to the one which produced the dermatitis, and patient 65 (L. J.) had been given 4 injections over a period of two months before a subsequent injection two months later caused the cutaneous lesion. The dermatitis in each person lasted about one month. Just why such a sensitivity reaction should occur is a matter of conjecture. Some authors have suggested that it is probably due to an indiscernible liver protein fraction which may be present in the fish oil. Bills,[19] who has made exhaustive studies on the chemistry of cod liver oil, has been unable to discover any protein. A few investigators have reported allergic manifestations following the use of monoethanolamine oleate in the treatment of varicose veins. Since this preparation is a synthetic preparation from vegetable oil in aqueous solution, it is hardly probable that the allergic reactions were due to any protein. Is it possible that a small, indeterminate amount of vegetable protein could be present, or that the patient might become sensitive to fatty or oily extracts? One hundred and thirty injections of sylnasol and about the same number of injections of monoethanolamine oleate were administered during this investigation. No evidence of sensitivity developed with either of these agents. In 2 cases, four and eight months respectively elapsed between the first and the last injection. Since approximately twice as many injections of sodium morrhuate were made as of either of the other two preparations, one should be hesitant in condemning it from the standpoint of sensitivity on the basis of the 2 cases of mild localized dermatitis which developed after its administration. The fatty acid derivatives are now so universally used for other conditions, with so few untoward effects, that it is apparent that such reactions are rare. Nevertheless, it behooves one to be cautious in administering large doses. Since 0.25 to 0.5 cc. of the preparations is used for injection into the turbinates, it seems unlikely that such a small dose should have any serious untoward effect. From the literature and

19. Bills, C. E.: Personal communication to the author.

the 2 cases of dermatitis following injection of sodium morrhuate herein reported, it appears that occasionally sensitivity to the sclerosing agents may develop, but only after a period has elapsed before another injection is made.

An increase in the congestion of the mucous membrane immediately follows the injection of these sclerosing preparations. A mucoid discharge is also noticed for about two days. Improvement in breathing through the nostrils begins from the third to the fifth day. Most patients state that there is little or no pain after the injection. Some have noticed a dull pain in the region of the nose and cheek, which sometimes radiates toward the eye. This is entirely relieved by acetylsalicylic acid or other coal tar derivatives. The dull pain has persisted for as long as two days in a few patients. Most of this discomfort is apparently due to pressure symptoms from the nasal congestion which immediately follows the injection, as astringent "nose drops" give relief.

Since the beginning of this investigation, 68 patients have been treated with sodium morrhuate, 28 patients with sylnasol, and 25 patients with monoethanolamine oleate.

EXAMINATION OF TISSUE

Tissue was obtained by a punch forceps or a Grünewald forceps from patients in whom both turbinates appeared clinically similar and shrank equally well. The specimens for biopsy were obtained from the middle third of one inferior turbinate before treatment and from the corresponding portion of the opposite inferior turbinate after the completion of treatment, the interval varying with different patients. For instance, the tissue was removed one month after treatment in 1 patient and two, four or twelve months after treatment in other patients. Tissues for microscopic study were removed from only a few patients in each group, because the fibrosis which follows the biopsy might give a false impression as to the benefit from the injections into the turbinate in which the specimen was taken prior to treatment. Dr. G. H. Hauser, pathologist, cooperated in the histologic study.

The characteristics common to the tissues examined microscopically before injection of the sclerosing agents were as follows (fig. 1): (1) dilatation of the vascular sinuses; (2) hypertrophy and some hyperplasia of the glandular elements; (3) chronic inflammation, as shown by small round cell infiltration; (4) many small blood spaces just beneath the epithelium in some specimens; (5) polypoid tissue and cystic changes in the mucous glands in others; (6) thinning of the epithelium in most tissues, with little or no evidence of cilia; (7) a layer of hyalin-appearing substance just beneath the basement membrane in some specimens. The significance of the last change has not been determined.

Fig. 1 (case 36; G. W.).—Biopsy specimen taken from the inferior turbinate before treatment with sodium morrhuate. Note the large vascular sinuses and small round cell infiltration, characteristic of the type of obstructive rhinitis which shrinks well with astringent solutions and does not belong to the specific or allergic group.

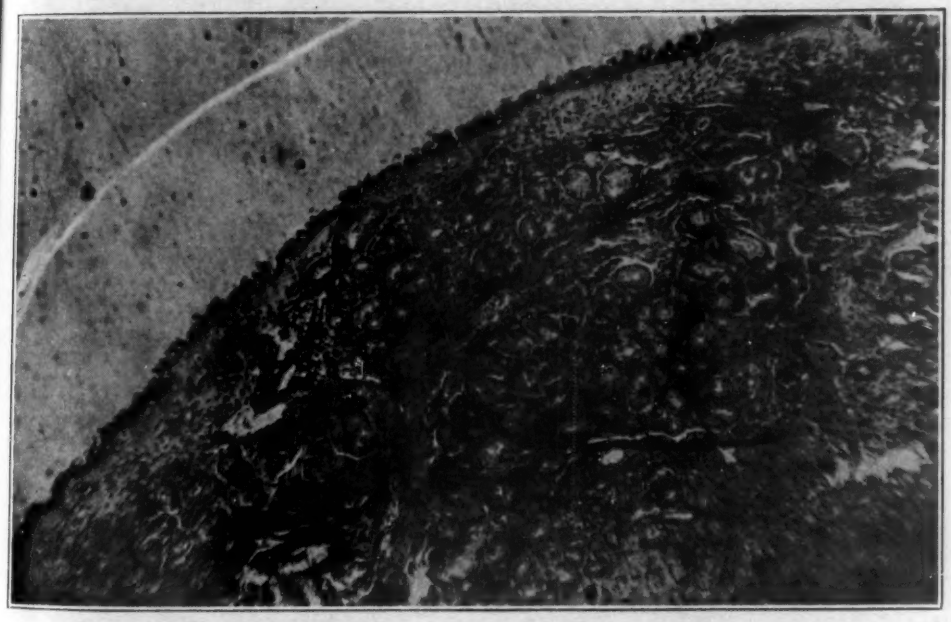

Fig. 2 (case 36; G. W.).—Biopsy specimen taken one month after 1 submucosal injection of 0.5 cc. of sodium morrhuate solution into the inferior turbinate. Note the increase in leukocytic infiltration and the reduction of the vascular sinuses.

The characteristics common to the tissues examined microscopically at varying intervals after the completion of treatment with the sclerosing solutions may be summarized as follows (figs. 2, 3, 4, 5 and 6): 1. Diffuse fibrosis was present throughout the tunica propria. 2. In general, the mucous glands were plentiful but showed less distention of the goblet cells and less activity, as indicated by there being less mucus in the lumen of the glands. The fibrosis surrounding the glands gave the impression of pressure being exerted on them. 3. Small round cell infiltration, indicative of chronic inflammation, was still present to varying degrees. 4. Vascular sinuses were less numerous, and remaining ones were smaller, with more supporting fibrous structure. 5. The epithelium was intact and normal. 6. Specimens taken a year to eighteen months after completion of treatment did not show any atrophic changes. The amount of fibrosis was similar to that observed in biopsy specimens taken only a few months after injection, and there was less small round cell infiltration. The vascularity was not demonstrably increased after this period had elapsed. 7. A comparative study of biopsy specimens

Fig. 3 (case 2; L. T.).—Biopsy specimen from the inferior turbinate taken eleven weeks after 2 submucosal injections of sodium morrhuate solution of 0.5 cc. each. Note the increased fibrosis, decreased round cell infiltration and reduced size of the vascular sinuses. Although the epithelium is thin, no ulcerations are present. (This may be due to mechanical injury produced during the procedure of taking the specimen for biopsy.)

Fig. 4 (case 1; R. M.).—Biopsy tissue taken from the inferior turbinate six months after 1 injection of 0.25 cc. and 2 injections of 0.5 cc. each of sylnasol had been made. Note the intactness of the epithelium and the basement membrane, the diffuse fibrosis, the reduction of the vascular spaces and the small amount of round cell infiltration.

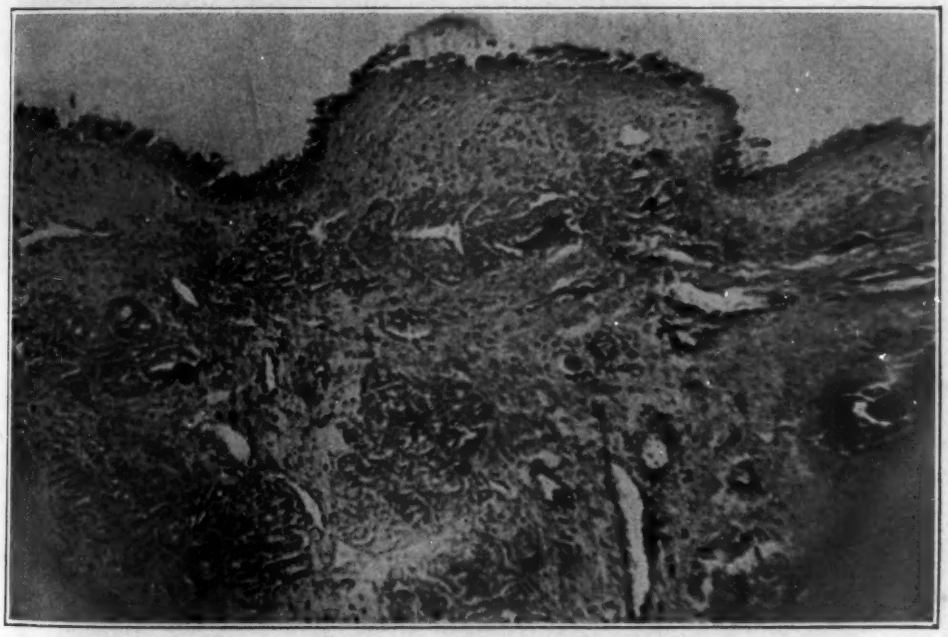

Fig. 5 (case 2; A. D.).—Biopsy specimen from the inferior turbinate one year after 2 injections of sylnasol. The size of the vascular sinuses remains reduced, the epithelium is intact and fibrosis is present. There is still some round cell infiltration.

taken after treatment revealed that all three preparations produced about equal sclerosing effects.

The clinical benefit was brought about by the contracting effect of fibrosis, resulting in the obliteration or great reduction in the size of the vascular and tissue spaces. This must have reduced the activity of the mucous glands also, since the postnasal dripping either ceased or definitely decreased and the microscopic picture revealed reduction of mucus in the lumen of the glands, as well as in the goblet cells. There was no evidence that degeneration of the tunica propria resulted

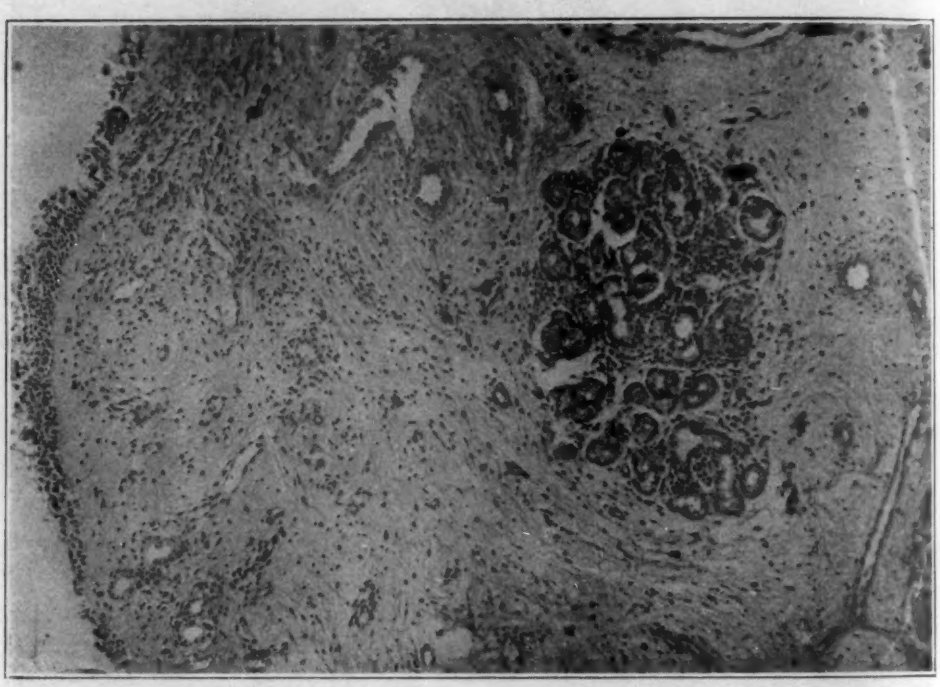

Fig. 6 (case 9; F. P.).—Biopsy specimen from the inferior turbinate taken four months after 2 submucosal injections of 0.5 cc. each of monoethanolamine oleate solution. Note the normal appearance of the epithelium and basement membrane. There is fibrosis, with reduction in the size of the vascular spaces in the tunica propria.

from the treatment. Since the amount of fibrosis produced by the sclerosing agent varied, each patient must be treated as an individual case. One injection in one person may produce as much contraction as 2 or 3 injections in another patient. Therefore, a physician should govern the number and the amount of the injections at two to three week intervals according to the clinical results obtained. One must not overlook the possibility of overtreating the patient. An excessive amount of fibrosis would defeat the ultimate aim of this form of therapy, which is to produce the optimal amount of clinical benefit without stimulating an overproduction of fibrous tissue.

CLINICAL EVALUATION OF THE FATTY ACID SCLEROSING AGENTS

Sixty-eight patients with chronic nonspecific, nonallergic obstructive rhinitis which shrank well with astringents who were treated with submucosal injections of sodium morrhuate were observed for at least a year

Effect of Submucosal Injections of Fatty Acid Solutions into the Turbinates on Nasal Obstruction and Associated Symptoms in Cases of Nonspecific, Nonallergic Obstructive Rhinitis Which Shrinks Well with Astringent Solutions

Symptoms	Sodium Morrhuate		Sylnasol		Monoethanolamine Oleate	
	No. of Cases	Percentage of Cases	No. of Cases	Percentage of Cases	No. of Cases	Percentage of Cases
Nasal obstruction	68		28		25	
Complete relief	58	85	23	82	22	88
Occasional blockage	8	11.7	4	14	3	12
No relief	2	3	1	3.6	0	
Sinusitis	15	22	7	25	5	20
Headache	51		19		12	
Complete relief	41	80	15	79	10	83
Improvement	8	15	3	16	2	16
No relief	2	4	1	5	0	
Sphenopalatine ganglion neuralgia	12		8		4	
Complete relief	8	66.6	5	62	1	25
Improvement	2	16.6	2	25	2	50
No relief	2	16.6	1	12	1	25
Postnasal dripping	42		20		14	
Complete relief	17	40	9	45	5	35
Decrease	22	52	10	50	8	57
No improvement	3	7	1	5	1	7
Otalgia; tinnitus; deafness*	10		1		2	
Complete relief	8	80	1	100	2	100
Improvement	2	20	0		0	
Sneezing	7		3		4	
Complete relief	4	57	2	66.6	1	25
Decrease	3	43	1	33.3	3	75
Cough	4		1		4	
Complete relief	3	75	0		2	50
Improvement	1	25	1	100	2	50
Chronic pharyngitis	10		3		4	
Complete relief	6	60	2	66.6	2	50
Improvement	3	30	1	33.3	2	50
No improvement	1	10	0		0	
Hoarseness (chronic laryngitis)	3		0		1	
Complete relief	3	100	0		1	100
Anosmia	2		1		2	
Complete relief	2	100	1	100	2	100

* Deafness of the conduction type due to chronic otitis media.

to eighteen months after the completion of the injections. It was necessary in the case of patient 1 (E. J.) to give another injection of 0.5 cc. into one turbinate one year after the last of the previous injections was given, and that patient is still free from his former symptoms, six months later. The composite tabulation of results (table) reveals that the nasal obstruction and its associated symptoms were alleviated or improved. After twelve to eighteen months 85 per cent of the

patients were still completely free of nasal obstruction, and about 12 per cent had only occasional nasal blockage! Only 2 patients, or about 3 per cent, failed to obtain prolonged benefit from the symptoms of nasal obstruction. One of these subjects was asthmatic, and although she breathes better through the nostrils, the turbinates are still rather pale and turgescent. The other patient has manifestations of an unstable vasomotor mechanism, is alcoholic and in general leads a life of unrestrained activity which is not in accordance with the principles of good hygiene. The associated headaches were completely relieved in 80 per cent of the patients and definitely improved in 15 per cent, with no benefit in only 4 per cent. Two thirds of the patients with neuralgia of the sphenopalatine ganglion were relieved completely; one sixth were definitely benefited, and the other one sixth still complain of Sluder's syndrome. The last patients had associated sphenoiditis, as shown by irrigation, culture of material and roentgenographic examination of the sinuses with an opaque oil. The nasal obstruction was completely relieved in these 2 subjects. All but 7 per cent of the patients complaining of postnasal dripping were completely relieved of this symptom or the discharge was greatly decreased. Eighty per cent of the 10 patients complaining of the associated symptom of otalgia, tinnitus and deafness due to chronic otitis media, either singly or in combination, were relieved after completion of the treatment. The other 20 per cent stated that the symptoms were not nearly so severe after the treatment. One patient who had chronic suppurative otitis media of twelve years' duration has been free from a discharging ear for ten months, since the nasal obstruction was corrected. Seven patients complained of sneezing as an associated symptom of the nasal obstruction. Four of these persons have been completely relieved of the sneezing, and the other 3 sneeze only occasionally. Two patients had anosmia, which had existed for a long time. Both these persons recovered their olfactory function completely after treatment. The cough, chronic pharyngitis and chronic laryngitis, due to the postnasal dripping, were either completely relieved or definitely improved after treatment. Two undesirable features may present themselves with the sodium morrhuate therapy. If, by accident, the drug should escape onto the surface of the nasal mucosa, a slight sensation of burning occurs, which lasts a few minutes, and a fish oil taste and odor are somewhat nauseating to some patients. Allergic manifestations may arise from the use of this preparation, if a period elapses between injections. Two cases of localized dermatitis occurred in this series. No serious reactions were observed, such as have been experienced by a few investigators in treating hernias and varicosities.

Sylnasol produced excellent clinical results. Six months to over a year has passed since the 28 patients completed treatment. So far, none of this group has required more injections. It will be noted in the table that with this sclerosing agent 96 per cent of the 28 patients either were completely relieved of the nasal obstruction or have only occasional nasal blockage. The improvement or disappearance of the associated headache, sphenopalatine syndrome, postnasal dripping, sneezing, etc., was just as pronounced with this preparation as with sodium morrhuate. There has been no evidence of sensitivity to the drug in this series, and I have been unable to find any report of an allergic reaction in the literature. Accidental escape of this sclerosing solution into the nasopharynx does not produce a taste or odor sufficiently disagreeable to cause the patient to complain. There is a slight burning sensation which lasts a few minutes if the solution escapes onto the mucosa.

Monoethanolamine oleate was injected into the turbinates of 25 patients who were suffering from the type of nasal obstruction under discussion. This was the last preparation to be studied, and only four to eight months have elapsed since the patients finished the treatment. So far, this sclerosing agent has appeared to produce as good clinical results as the other two fatty acid derivatives. No evidence of allergic manifestations to the drug was observed in this series. A few cases of sensitivity attributed to this preparation have appeared in the literature. The accidental escape of the solution produced a slight burning sensation, but the patients did not complain of any objectionable taste or odor.

Evidence of chronic sinusitis was present in 20 to 25 per cent of the patients treated with one of the three fatty acid preparations. It is characteristic of many patients suffering from chronic sinusitis that the turbinates become more or less persistently engorged, which, in turn, tends to prevent good drainage and ventilation of the paranasal sinuses. The blocking off of the ostiums aggravates the symptoms of sinusitis because of the retention of purulent material, thus producing a vicious cycle. If, after a thorough trial, the treatment of sinusitis itself is refractory to the accepted methods of treatment, the shrinkage of the turbinates undoubtedly will facilitate the restoration of the physiologic functions of ventilation and drainage. This therapy is not offered as a panacea for chronic sinusitis, but it is an adjunct to the treatment of patients who fail to respond to the recognized methods because it breaks the vicious cycle. With the exception of the few patients with sphenoiditis and neuralgia of the sphenopalatine ganglion, the pains and headache were completely relieved or improved. The postnasal dripping was entirely relieved or was improved in the vast majority of the patients.

The few persons with a purulent discharge obtained relief from the nasal obstruction and were free of the associated symptoms of pain and headache because of the better drainage produced.

The clinical appearance of the turbinates of some of the patients were characteristic of mild allergy, being boggy and pale. These patients obtained relief from the symptoms. It must be emphasized again, however, that the true seasonal type of allergy was not treated during this investigation.

The amount of sodium morrhuate solution (5 per cent), sylnasol or monoethanolamine oleate solution (5 per cent) necessary to produce the optimal amount of clinical benefit averaged 2 injections of 0.5 cc. each, or a total of 1 cc. for each turbinate. Some patients required only 1 injection per turbinate, while others required as many as 4, or a total of 2 cc. of the drug per turbinate. In this respect, the three fatty acid solutions were similar.

Three of the 121 patients treated stated that a sensation of dryness in the nose and some discomfort in the bridge of the nose were noticeable for as long as one month after completion of treatment.

SUMMARY

A simplified classification of obstructive rhinitis is presented. Sixty-eight patients with nonspecific, nonallergic forms of chronic obstructive rhinitis which shrank well with astringents were treated with submucosal injections of sodium morrhuate (5 per cent solution); 28 patients were given sylnasol, and 25 were treated with monoethanolamine oleate (5 per cent solution). Excellent clinical results were produced with these fatty acid derivatives. As long as one year to eighteen months has elapsed since the patients completed treatment with sodium morrhuate and sylnasol, and nasal obstruction has not recurred. The associated complaints of sphenopalatine neuralgia, headache, postnasal dripping, and in a few patients anosmia, hoarseness and coughing, have been either completely relieved or definitely decreased. Only four to eight months has passed since the series receiving monoethanolamine oleate completed treatment. The former symptoms of these patients have not returned.

This method of treatment is beneficial as an adjunct in the treatment of patients with obstinate, refractory chronic sinusitis in whom the engorged turbinates prevent drainage and aeration of the sinuses. In 2 patients localized dermatitis developed when sodium morrhuate was given at an interval after several previous injections. Some patients also complained of the fish oil odor and taste of this solution when it was accidentally spilled on the nasal mucosa. Consequently, the other two fatty acid derivatives are somewhat more desirable for use than the sodium morrhuate. The clinical results of any of the three fatty acid preparations are equally good.

Submucosal injection of the fatty acid solutions is preferable to most of the other forms of therapy because (*a*) it is easily carried out and requires no expensive equipment and (*b*) no ulcerations or adhesions and, as shown by microscopic examination, no deleterious effect or damage to the mucous membrane follows the treatment. The appearance of this tissue tends to return to that of normal nasal mucosa.

The following pharmaceutic houses supplied the drugs used in this investigation: G. D. Searle & Co., Chicago (sylnasol and sodium morrhuate); Abbott Laboratories, North Chicago (monoethanolamine oleate [monolate] and butyn sulfate); Winthrop Chemical Co., Inc., New York (pontocaine hydrochloride); E. R. Squibb & Sons, New York (intracaine hydrochloride).

Bank of Wayne Building.

BOWEN'S DISEASE AND SUPERFICIAL MUCOSAL EPITHELIOMA OF UPPER RESPIRATORY AND ALIMENTARY TRACTS

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Bowen's [1] "precancerous dermatosis" is still considered by some authors as a precancerous dyskeratotic process but is regarded by the majority as a highly specialized form of superficial squamous cell epithelioma with lateral intraepithelial spread.

The histologic characteristics of Bowen's disease of the skin were stated by Stout [2] as follows:

> The epidermal layer is thickened and sometimes made papillary by a multiplication and disorientation of the Malpighian cells. The cells vary in size and shape, there are many mitoses, and some of them are . . . abnormal. Monster cells with several nuclei centrally clumped together were originally described by Bowen.

Darier [3] coined the term poikilokarynosis to describe these changes. Furthermore, foam cells (Kreibich [4]) with vacuolated cytoplasm, isolated cell nests within the epithelium (Grzybowski [5]) and cells with a clear vacuole partly or completely surrounding the nucleus (*corps ronds*, Darier) are sometimes observed. Intracellular fibrils are usually lost, but intercellular bridges are often retained. The corneal layer is thickened and shows parakeratosis. The palisade arrangement of the basal layer often disappears, but the basal membrane remains intact. [There is heavy round cell infiltration of the papillary layer, the deeper parts usually being free.] In only a small percentage of cases does Bowen's disease of the skin, after a long period of existence, go on to penetrative growth and formation of metastases. Histologically, according to Stout,[2] the picture in these cases is one of an atypical squamous cell

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epithelioma, or the poikilokarynosis of the intraepithelial lesion (Bowen's epithelioma) is reproduced. Sometimes the local infiltration is hardly visible; nevertheless, metastases may be seen.

Bowen's disease is a disease of the stratified squamous epithelium; it is much more frequent in the skin than in the mucous membranes. Stout found among his 57 cases only 2 in which the mucosa was involved. Nevertheless, a number of cases of the latter type have already been published. Three areas were the sites of lesions.

Upper Respiratory Tract.

Nares (Hudelo and Cailliau [6]).

Upper Digestive Tract.

Upper lip (Noguer More [7] and Howarth [8]).

Floor of mouth (Howarth [8] and Stout [2]).

Tongue (Cipollaro and Foster [9]).

Mucosa of the cheeks (Howarth,[8] Touraine and Golé [10]).

Gums (Favier,[11] Touraine and Golé).

Soft palate; tonsillar pillars; uvula (Howarth,[8] Gougerot, Moulonguet and Lortat-Jacob [12]).

Tonsils (Hudelo and Cailliau [6]).

Esophagus (Cailliau and Leroux [13]).

Lower Genital Tract.

Vulva, vagina, portio vaginalis cervicis uteri, penis and prepuce.

Recently cases of lesions in the conjunctiva bulbi and cornea have been described by McGavic.[14] In general the parts near the external orifices are more frequently affected than the more remote portions.

The development of Bowen's disease in the upper portion of the digestive tract and the lower part of the genital tract, which are covered with stratified squamous epithelium, can easily be understood; in the nasal mucosa, unless the disease occurs in the anterior nares, it must be assumed that the disorder was preceded by metaplasia of the pseudostratified columnar epithelium to form stratified squamous epithelium.

In the mucous membranes the hyperkeratinization, which is a regular feature of the changes in the skin, is frequently absent, and the lesion

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is clinically represented by a red, velvety, slightly thickened patch, which without biopsy cannot be distinguished from Queyrat's erythroplasia. In the less frequent cases in which hyperkeratosis is present the clinical picture resembles leukoplakia (early stage as reported by Cipollaro and Foster[9]). The cellular changes are less distinctive in the cases of mucosal than in those of cutaneous involvement. Nevertheless, the presence of poikilokarynosis is an indispensable prerequisite of the diagnosis.

Transition into frank cancer (cancerization) is much more frequent in cases of the mucosal than in cases of the cutaneous form of the disease (2 to 3 per cent as compared with 40 per cent, according to Stout). Clinically the lesions tend to become nodular or papillomatous, and slight infiltration of the base develops (latent stage, as described by Cipollaro and Foster[9]). Eventually the nodular and papillomatous areas ulcerate; the base becomes heavily infiltrated, and metastases may occur (late stage, as described by Cipollaro and Foster).

Cipollaro and Foster expressed the belief that Bowen's disease of the mucous membranes is more common than is generally recognized. In the last few years we have had the opportunity to observe 6 cases which were either typical instances of Bowen's disease of the mucous membranes or which in their histologic picture showed various degrees of resemblance to this condition. Four of them were localized in the upper respiratory tract and 2 in the upper part of the alimentary tract.

REPORT OF CASES

The histologic preparations in all these cases were seen by Dr. A. P. Stout, who agreed with the reported observations.

CASE 1.—S. G., a man aged 71, nine months before admission noticed a small sore inside the left nostril, near the tip of the nose. He kept it soft with various ointments, but all were applied without improvement.

Examination.—The region of the left Kiesselbach area was covered by a thick, velvety mucous membrane. This area measured 2 cm. in diameter and contained a central ulceration, measuring 0.5 cm. in diameter. A few curettings were removed for microscopic examination.

Microscopic Examination.—The sections showed fragments of stratified squamous epithelium without any submucous tissue. The epithelium was bizarre, the cells varying greatly in size and shape, with giant, hyperchromatic forms but rare mitoses. Some cells showed vacuolation of the cytoplasm (foam cells); in others the nuclei were partly or completely surrounded by clear vacuoles. The epithelium was infiltrated with many inflammatory cells, including both polymorphonuclear leukocytes and lymphocytes. The peculiar appearance of the epithelium suggested Bowen's disease, but no definite diagnosis could be made because it was impossible to tell whether there had been any infiltrative growth. In the latter case the diagnosis of an early epithelioma would be more justified.

Operation.—A few days later the affected area, including a portion of the skin of the columella and of the anterior part of the cartilage, was removed by sharp dissection.

Microscopic Examination of Second Specimen.—The usual layers of the stratified squamous epithelium were replaced by epithelial cells which were relatively large and hyperchromatic, with an average of 1 mitosis per high power field. A number of these cells were giant forms, and some had more than one nucleus and strongly suggested the clumping forms of Bowen. There were also some cells, particularly in the less involved portion of the mucous membrane, in which clear zones surrounded the nucleus. These were probably the so-called Darier cells. Immediately beneath the epithelium was a massive infiltration, composed chiefly of plasma cells, together

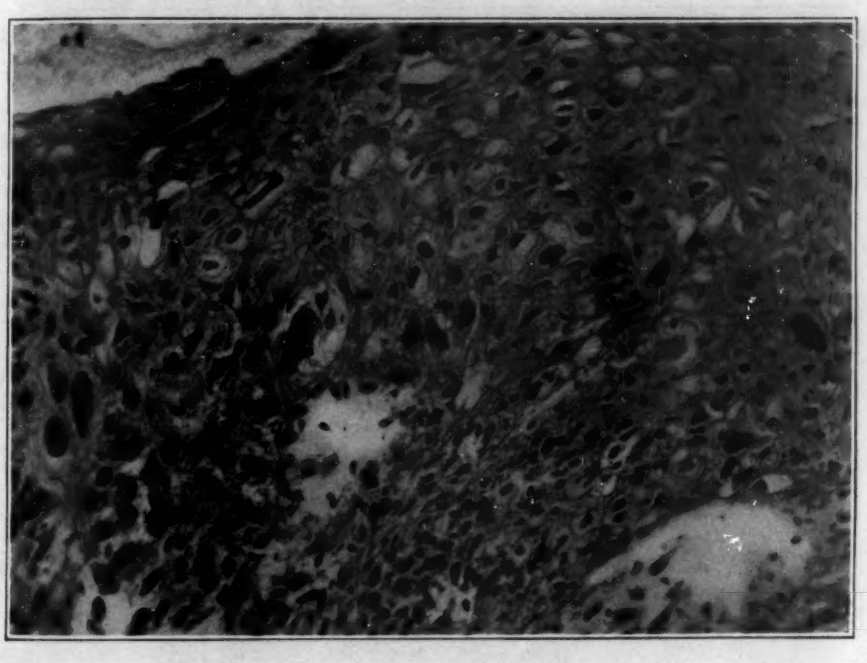

Fig. 1 (case 1).—Anterior part of the nasal septum.

with a few lymphocytes and monocytes. Invasion of the mucosa by the epithelium to any appreciable amount could not be seen.

Diagnosis.—The diagnosis was Bowen's disease.

Course.—The patient was completely cured and died two years later of another disease.

CASE 2.—W. J., a man aged 70, was first admitted on March 13, 1937, with a history of hoarseness of six weeks' duration. There had been no previous attacks or other symptoms.

Laryngoscopic Examination.—A small tumor was seen on the right vocal cord, at the junction of the anterior and the middle third. No ulceration, bleeding or limitation of motion was noted. The lesion was removed with biting forceps the same day.

Microscopic Examination.—The specimen showed a papillary structure, composed of edematous, rather delicate tissue supporting thick coverings of stratified squamous epithelium. The epithelial cells, particularly near the basal layer, varied considerably in size and shape, and there were occasional whorls, as in pearl formation. Intercellular bridges were less clear than normal. In many places the normal stratification had been lost. Some of the cells showed large hyperchromatic nuclei; others, several nuclei clumped together. In a few cells the nucleus was surrounded by a clear vacuole. There were numerous mitotic figures in and near the basal layer, and some of the mitoses appeared abnormal. The supporting stroma was infiltrated with round cells and polymorphonuclear leukocytes. There was no infiltrative growth of the epithelium into the underlying stroma.

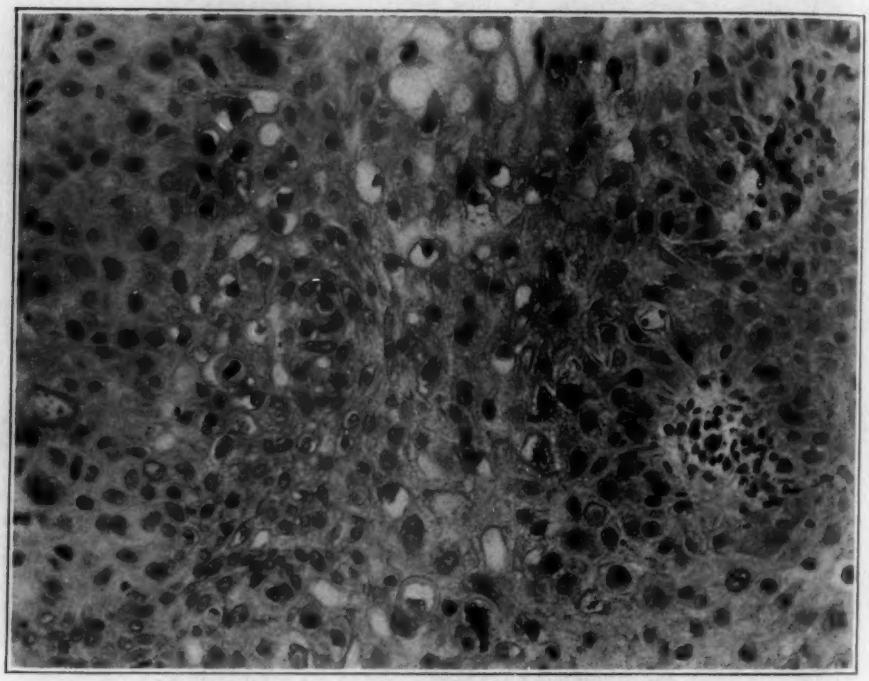

Fig. 2 (case 2).—Right vocal cord.

Diagnosis.—The lesion was a papillary growth with extreme hyperplasia, considerable variation in cell morphology and many mitotic figures. The presence of "poikilokarynosis," some Bowen cells and a few Darier cells, together with lack of infiltrative growth, makes the diagnosis of Bowen's disease probable.

Course.—After the removal of the tumor the patient was well. A year later, on April 4, 1938, he was readmitted with the complaint of huskiness of the voice of two and one-half months' duration.

Second Laryngoscopic Examination.—A small tumor was seen on the right vocal cord at exactly the same place from which the first growth had been removed. The present tumor was removed through the laryngoscope.

Microscopic Examination of Second Specimen.—The specimen showed clearly the picture of Bowen's disease. The borders of the tumor toward the normal

epithelium were not well defined, but the epithelial changes decreased gradually in intensity and were finally replaced by normal epithelium.

Third Admission.—Seven months later, on November 7, the patient was again admitted to the hospital, with recurrence of hoarseness.

Third Laryngoscopic Examination.—There was a small tumor on the right vocal cord at the same location and of the same appearance as the two tumors previously removed. Mobility of the cords was normal, and there were no signs of infiltration of the underlying tissues. The growth was again removed with biting forceps.

Microscopic Examination of Third Specimen.—The picture was exactly the same as that in the preceding specimen.

Subsequent Course.—Up to January 1940 no recurrence of the growth had been seen, and the patient had no complaints whatever.

Case 1, which was briefly mentioned by Stout, represents the typical histologic picture of Bowen's disease and resembles clinically the case described by Hudelo and Cailliau.[6] Histologically the cases differ in that the tumor in the case of Hudelo and Cailliau had a papillomatous surface.

In case 2, which likewise was briefly mentioned by Stout, all the histologic characteristics of Bowen's disease also are shown. It is the first observation of a laryngeal localization. The changes originated in the stratified squamous epithelium covering the right vocal cord. The disease was represented by a papillary growth, with well marked hyperkeratosis. It might be mentioned that in the case of Bowen's disease of the esophagus (Cailliau and Leroux [13]) the picture was that of a papilloma without hyperkeratosis.

That the tumor recurred twice need not indicate its malignant nature but can be explained on the assumption that it had not been removed completely. The borders of the diseased parts toward the normal epithelium were not well defined, so that it was easy for some rests of the diseased tissue to have been left, even after clinically complete removal of the growth.

These 2 cases do not offer any serious diagnostic difficulties and represent mucosal manifestations of unquestionable Bowen's disease. The following cases, which show many, but not all, the features of Bowen's disease, are of greater theoretic interest.

CASE 3 (reported by permission of Dr. George Semken).—C. G., a man aged 68, in March 1931, at the age of 60, had the left tonsil removed. No histologic report could be obtained. In September 1932 a radical dissection of the left side of the neck was done for a large tumor of a lymph node in the region of the carotid artery. The pathologic report was squamous cell epithelioma. No primary tumor could be found, and it was felt that the previously removed tonsil might have been the seat of the primary tumor. A year later, in 1933, a small tumor was removed from just below the left tonsillar space. Microscopic examination showed an undifferentiated squamous cell epithelioma. A year later, in 1934, there was a local recurrence just below the site of the tumor in the left tonsillar space. The growth was removed by pharyngotomy.

Microscopic Examination.—The specimen showed undifferentiated squamous cell epithelioma. The surface epithelium at the lower edge of the specimen was irregular. The epithelial layer was thickened. The papillae were broadened. The normal stratification had been lost; the cells varied in size and shape; the intercellular bridges were poorly developed or completely missing. At some places giant cells were seen, but few contained several nuclei. Perinuclear clear vacuoles were seen in many cells. An average of 1 to 2 mitotic figures per high power field were present. Foam cells were not infrequently seen. At the surface there was a moderate amount of keratinization, which was mostly parakeratotic. The basement membrane remained intact. There was marked lymphocytic and plasmocytic infiltration of the subepithelial layers, the deeper layers being free.

Diagnosis.—The diagnosis was undifferentiated squamous cell epithelioma of the lateral pharyngeal wall, with epithelial changes at the lower edge of the specimen, suggesting Bowen's disease of the pharyngeal mucosa.

Fig. 3 (case 3).—Right tonsil.

Second Examination.—Two years later (1936) examination showed a papillomatous tumor of the posterior wall of the hypopharynx, extending from the midline across the left half, nearly to the edge of the epiglottis.

In October 1936 the tumor was removed by subhyoid pharyngotomy.

Microscopic Examination.—The specimen was reported to be well differentiated papillary squamous cell epithelioma.

Course.—There was no further recurrence until 1939, when a small papillary tumor developed at the lower pole of the right tonsil. In May 1939 the tumor was removed, together with the right tonsil.

Microscopic Examination (fig. 3).—The surface epithelium of the tonsil, extending upward within a short distance of the upper pole, including the epithelial lining of many of the crypts, showed the same changes as those occurring at the lower edge of the first specimen. At the lower pole these changes passed into a typical papillary squamous cell epithelioma of exactly the same type as the last tumor removed from the left side. The tumor had apparently been cut through during

removal, so that one must anticipate reappearance of the growth in this region. The tonsil itself was atrophic and showed little evidence of inflammation.

Diagnosis.—The diagnosis was squamous cell epithelioma of the lower pole of the tonsil and Bowen's disease of the mucosa covering the tonsil.

Course.—A few months later there was a local recurrence, and in December 1939 the tumor was removed by infrahyoid pharyngotomy.

Microscopic Examination.—Examination revealed stratified squamous cell epithelioma, which tended to form relatively large masses of partly differentiated cells with keratinized centers and many intercellular bridges.

Outcome.—The patient died in June 1941, after irradiation for local recurrence.

In this case the left tonsil and, later, the enlarged cervical lymph glands had been removed. The latter contained an undifferentiated squamous cell epithelioma. One year later there was a recurrence in the lateral pharyngeal wall. The specimen removed from this area again showed an undifferentiated squamous cell epithelioma, but at the lower edge epithelial changes were seen identical with those in Bowen's disease. There was a gradual transition from these alterations to frank carcinomatous changes. The presence of a similar condition in the original lesion in the left tonsil is impossible to determine because a histologic report could not be obtained. Two years later another recurrent growth, histologically a well differentiated papillary squamous cell epithelioma, was removed. Two and one-half years later a tumor occurred at the lower pole of the right tonsil, histologic examination of which showed the typical picture of Bowen's disease in the surface epithelium of the tonsil and, at the lower pole, transition into papillary squamous cell epithelioma.

It cannot be decided with certainty whether the changes in the right tonsil were secondary to those in the left or developed independently, though in our opinion the latter assumption seems more probable.

It is interesting to note that in 2 of the specimens a transition from epithelial changes characteristic of Bowen's disease to those of frank carcinoma could be observed. "Cancerization" is rather frequent in the mucosal type of Bowen's disease, but usually it occurs late. On the right side a papillary squamous cell epithelioma was present, whereas in practically all the other cases in which "cancerization" had taken place either atypical squamous cell epithelioma or Bowen's epithelioma was observed (Stout).

In view of these facts, it remains questionable whether the condition in this case should be called true Bowen's disease with cancerization or whether, rather, it was a superficial squamous cell epithelioma resembling Bowen's disease with transition to frank carcinoma.

CASE 4.—C. J., aged 58, had a history of gradually increasing hoarseness for nine months, of rather sudden onset.

Laryngoscopic Examination.—A small pale mass with smooth surface was seen on the right vocal cord near the anterior commissure. The mobility of the cord was normal. The mass was removed with biting forceps on Sept. 19, 1939.

Microscopic Examination.—The specimen showed some evidence of activity in the surface epithelium, suggesting that it was taken from the vicinity of a neoplasm.

Second Biopsy.—A second specimen was taken on November 7.

Microscopic Examination of Second Specimen (fig. 4).—The stratified squamous epithelium was irregularly thickened, and many of the rete pegs were prolonged downward into the underlying tissue for a considerable distance. Sometimes they formed secondary lateral prolongations, giving them a dendritic appearance. In these thickened areas the epithelial cells showed a very considerable variation in relative size and appearance. Some of them were hyperchromatic and some multinucleated; occasionally small pearls were formed. Some mitotic activity was evident. In most

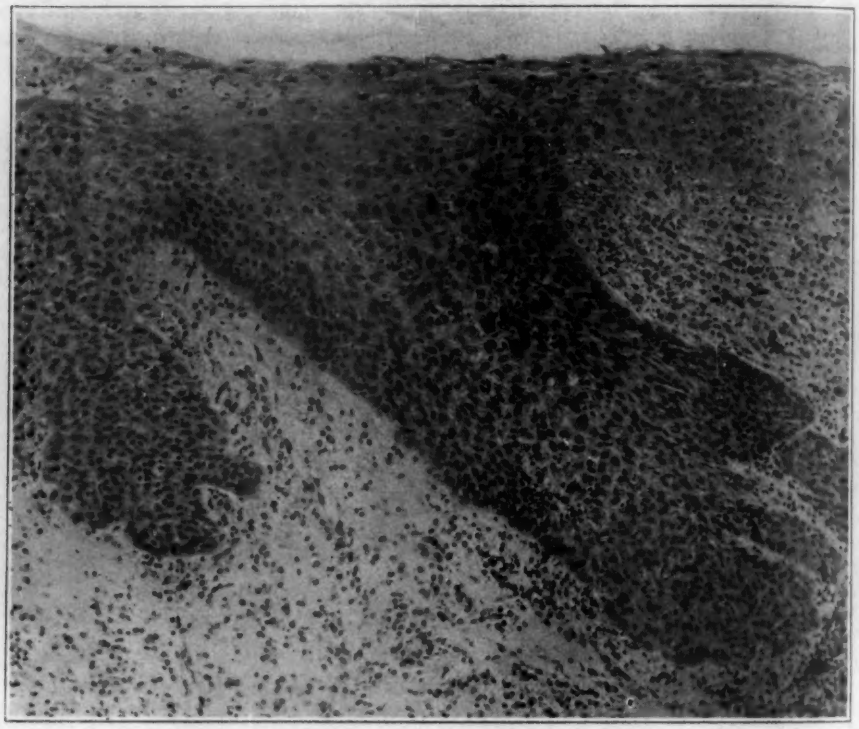

Fig. 4 (case 4).—Right vocal cord.

instances intercellular bridges were preserved, but the general impression was one of commotion and cellular unrest.

Diagnosis.—The diagnosis was superficial squamous cell epithelioma, akin to Bowen's disease (of bowenoid type).

Course.—Two months later a small thickening of the right vocal cord could still be seen, and the patient was still hoarse. A specimen for biopsy was taken on Jan. 2, 1940. Microscopic examination revealed nothing significant. In the following months the hoarseness decreased. On April 16, 1940 the cords were slightly red; otherwise the larynx looked normal.

CASE 5.—D. W., a man aged 53, when seen by Dr. M. Lenz, had two slightly raised, whitish indurations, one 10 and the other 15 mm. in diameter, halfway

between the right supratonsillar fossa and the uvula. Numerous leukoplakic patches covered the right half of the soft palate. There were no palpable nodes on either side of the neck. A biopsy specimen was taken in November 1936.

Microscopic Examination.—Section showed an undifferentiated squamous cell epithelioma.

Treatment.—Roentgen treatment (Coutard's method) was given from November 1936 to January 1937, the patient receiving a total of 7,600 r to the skin.

Course.—After the irradiation the lesion receded satisfactorily, but in August 1937 the patient returned with two tiny eroded areas, about 2.5 mm. in diameter, one on the right half of the soft palate and the other at the junction of the anterior tonsillar pillar and the base of the tongue. There was pronounced inflammatory redness of all the buccal mucosa. Biopsy showed leukoplakia and radiation reaction.

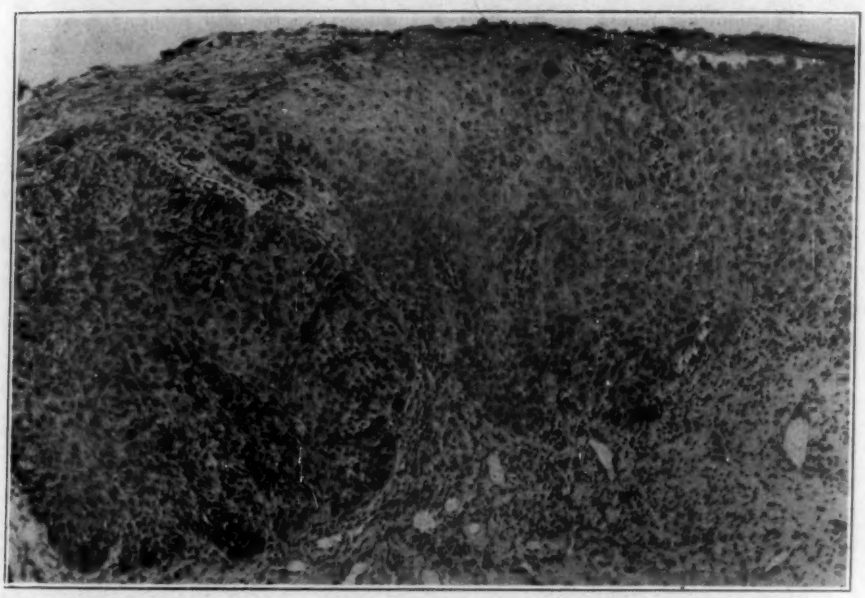

Fig. 5 (case 5).—Gum of the mandible.

Numerous other small erosions appeared within the next few months, and in November 1937 another biopsy specimen was taken from the most suspicious lesion. This, again, showed leukoplakia and radiation reaction.

The next year, in March 1938, the lesions had grown a bit, and a new one had appeared on the gum of the right mandible near its posterior extremity. The last lesion looked pale and granular and measured about 3 mm. in diameter. Biopsy of this lesion, along with one of the erosions on the palate, was made.

Microscopic Examination.—Palate: Tissue from this area again showed leukoplakia and radiation reaction.

Mandible (fig. 5): There were thickening of the surface epithelium and broad rete pegs. Stratification was preserved in many places. The individual epithelial cells showed considerable variation in shape and size; there were cells with one very large nucleus and some cells with several nuclei centrally clumped together, resembling Bowen cells. Mitoses averaged 2 per high power field. Intercellular

bridges were generally seen throughout these cell masses, and there were no epithelial pearls. The superficial layers of the mucosa showed moderate lymphocytic and plasmocytic infiltration. The lesion might be called a superficial squamous cell epithelioma of the bowenoid type.

Subsequent Course.—The patient was advised to stop smoking; the chronic irritation of the oral mucosa which was present heretofore subsided, and all but three of of the ulcers healed. These areas were watched at frequent intervals.

The following year, in February 1939, an erosion on the soft palate and the mandibular lesion had grown considerably. Both lesions were freely movable over the submucosa. Biopsies showed a moderately well differentiated squamous cell epithelioma of the gum of the mandible and a rather poorly differentiated squamous cell epithelioma of the soft palate.

Two weeks later both lesions were coagulated with electric current. The coagulation was followed by complete healing of the ulcers.

The following month, March 1939, a small nodule of hard tissue, 5 mm. in diameter, was seen at the junction of the right anterior tonsillar pillar and the base of the tongue. Biopsy showed a growth presenting the same microscopic characteristics as those in the previous specimen. In one place in the submucosa a small cluster of tumor cells was surrounded by dense masses of lymphocytes. The diagnosis was superficial squamous cell epithelioma of bowenoid type. The tumor was coagulated and disappeared.

In November 1940 several slightly raised patches of leukoplakia were seen along the right border of the uvula. In May 1941 the patches were still present, but the patient felt perfectly well and no signs of recurrence were seen.

In case 4 the lesion showed many features of Bowen's disease, such as thickening of the epithelium, with formation of dendritic rete pegs, and a certain degree of cellular variation and unrest, but other characteristics were absent. The lesion was diagnosed as superficial squamous cell epithelioma resembling Bowen's disease or of bowenoid type. The absence of pathologic changes in the last biopsy specimen was apparently due to the fact that the entire diseased area had been removed in taking the preceding biopsy specimens.

In case 5 several leukoplakic patches and a small undifferentiated squamous cell epithelioma were seen on the right half of the soft palate. The tumor disappeared completely after irradiation by the Coutard method. One year later two leukoplakic areas on the soft palate and a small lesion on the gum of the right mandible appeared. Histologically the latter lesion showed changes within the epithelium similar to those observed in case 4. The lesion, again, had to be called superficial squamous cell epithelioma of bowenoid type. One year later one of the leukoplakic spots on the soft palate had become a poorly differentiated squamous cell epithelioma and the lesion on the gum a moderately well differentiated squamous cell epithelioma. Both lesions were destroyed by electrocoagulation. A few weeks later a small nodule appeared in the lower part of the right tonsillar pillar. Histologically, the lesion again was a superficial squamous cell epithelioma of bowenoid type. In one place there was evidence of infiltrative growth, apparently the beginning of transition into frank cancer. The tumor was destroyed

by electrocoagulation. In this case there can hardly be any doubt that the lesions on the soft palate, the gum and the right tonsillar pillar had developed independently of each other. It may be of interest that cases of Bowen's disease of the skin which followed radiation dermatitis have been described.

CASE 6.—B. W., a woman aged 59, was first seen in January 1941 with a history of intermittent hoarseness for years. For the past six months the hoarseness had been almost continuous and had increased gradually in intensity. A specimen for biopsy was taken by laryngoscope from the left vocal cord and arytenoid cartilage.

Microscopic Examination.—A specimen of tissue taken from the left vocal cord showed thickening of the surface epithelium. The deeper layers displayed marked irregularity in the size and staining properties of the component cells, as well as complete loss of stratification in places. The tumor cells were large, with oval vesicular nuclei. The intercellular bridges were present. Mitotic figures averaged 2 to 4 per high power field. Occasional pearls with keratinization were seen. The basement membrane seemed to have been penetrated at several points, but nowhere had more than superficial invasion of the stroma occurred. There was considerable lymphocytic and plasmocytic infiltration of the subepithelial layers.

The section from the arytenoid cartilage showed less definite malignant changes in the epithelium.

Diagnosis.—The diagnosis was superficial squamous cell epithelioma (bowenoid type) of the larynx.

Second Examination.—Five days later a second laryngoscopy showed reddening and thickening of the anterior two thirds of the left vocal cord. This thickening did not extend over the arytenoid cartilage. Biopsy specimens were taken from the thickened part of the vocal cord and from the arytenoid area.

Microscopic Examination of Second Specimens.—Sections taken from both areas showed changes in the surface epithelium similar to those described in the previous biopsy specimen. Mitoses averaged 4 to 5 per high power field. Occasional bizarre multinucleated cells were seen.

Operation.—Laryngofissure was performed on Jan. 20, 1941, and the left vocal cord, the ventricular band and the mucous membrane covering the left arytenoid region were removed. Except for postoperative subcutaneous emphysema, which disappeared within a week, the postoperative course was uneventful.

Microscopic Examination of Tissue Removed at Operation.—The surface epithelium showed everywhere the same changes as those described in the previous biopsy specimens. Mitoses averaged 2 to 4 per high power field. Bizarre cells were numerous. In some places pearl formation was observed. The basement membrane remained intact except in a few places, but even there the infiltrative growth was inconspicuous and questionable. In some small areas intact stratified squamous epithelium was seen, and there was a gradual transition from the normal to the proliferated epithelium. The epithelial changes extended into the proximal part of the laryngeal ventricle (fig. 6). Here the tumor cells grew with a tonguelike projection along the basement membrane into the areas lined with pseudostratified columnar epithelium and detached the columnar epithelium from the basement membrane toward the lumen. There was not much, if any, evidence of infiltrative growth of the neoplastic cells into the columnar epithelium itself. The epithelial changes extended into the majority of the excretory ducts of the mucous glands of the larynx, and in several places even into the acini of the glands themselves (fig. 7). In several ducts the same proliferation of the neoplastic epithelium along the basement membrane in the direction of the periphery as that observed in the ventricle was clearly

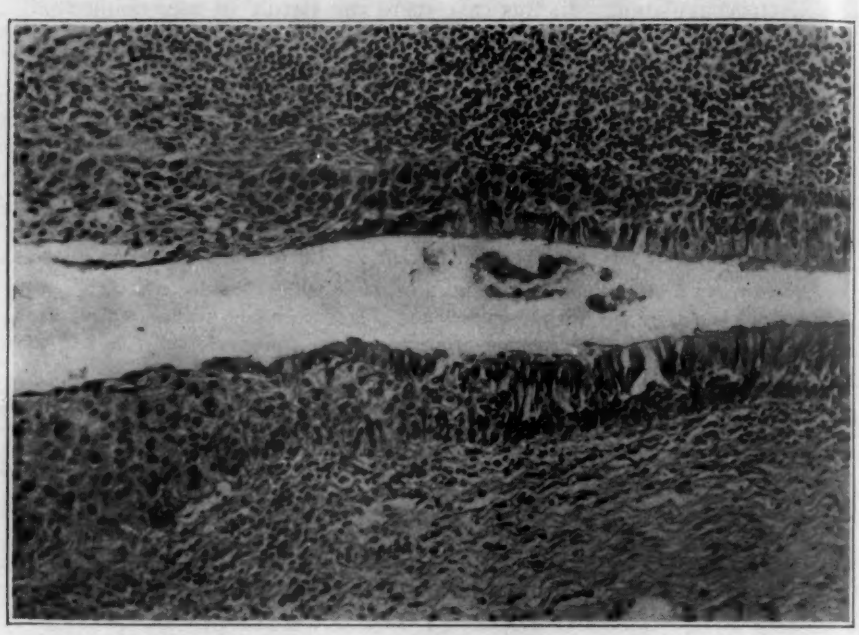

Fig. 6 (case 6).—Laryngeal ventricle.

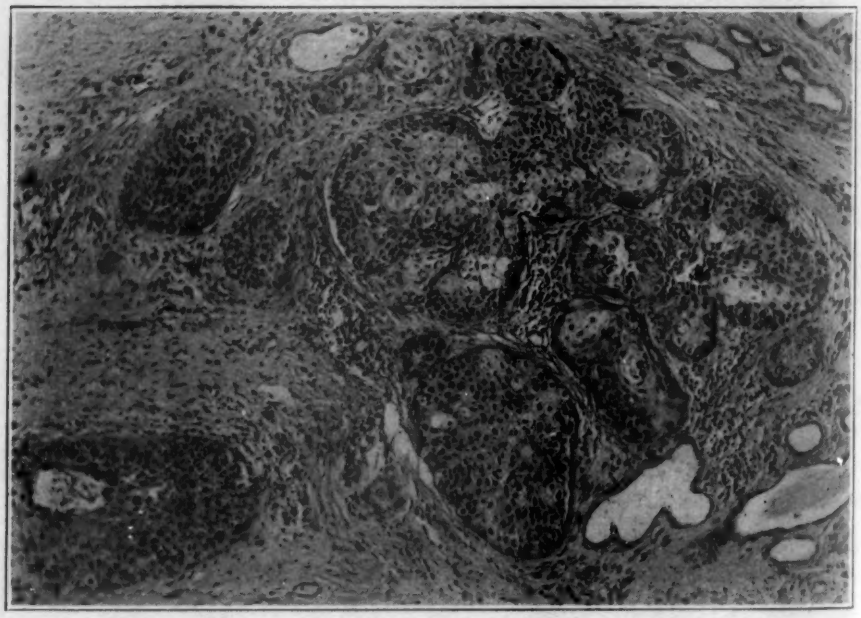

Fig. 7 (case 6).—Laryngeal glands.

seen. Some glands showed moderate dilatation of the peripheral parts of the ducts and of the acini; others, various degrees of atrophy of the glandular tissue. The stroma itself displayed considerable lymphocytic and plasmocytic infiltration in the subepithelial region and around the glandular ducts and acini.

Diagnosis.—The diagnosis was superficial squamous cell epithelioma (bowenoid type) of the larynx.

Course.—Reexamination in August 1942 did not show any recurrence.

This case was one of superficial squamous cell epithelioma which involved the mucous membrane of the larynx and spread into the ventricle, the glandular ducts and even some of the acini. The underlying tissue was not infiltrated except to a microscopic degree. Cancerization of the glandular acini is apparently exceptional in laryngeal growths and has never been observed by Stout (personal communication). It is often seen in tumors of the mamma and was observed in the cervix of the uterus by Inglis.[15] The tumor in the present case apparently originated in the stratified squamous epithelium, and the neoplastic cells were of the epidermoid type. The tumor had much less histologic resemblance to Bowen's disease than those in the preceding cases, but, nevertheless, it possessed the most important feature in common with them, i. e., the intraepithelial spread. In the areas lined with stratified squamous epithelium this spread took place in the same manner as in the other cases, by proliferation of the adjacent epithelial cells in situ; in the areas lined with pseudostratified columnar epithelium or simple columnar epithelium a kind of expansive growth of the neoplastic cells along the basement membrane toward the periphery was seen. The histologic picture of these changes resembled that described by Brighton, Altmann and Hagan [16] in a case with progressive epiderminization of the laryngeal ventricle following Coutard irradiation. There is one important difference between these 2 cases. The columnar epithelium was replaced by neoplastic epithelium in the case described here, while in the case following irradiation it was replaced by normal stratified squamous epithelium.

COMMENT

In cases 1 and 2 the picture was typical of Bowen's disease; in the other 4 cases many, but not all, the characteristics of the disease were present. In these cases the degree of poikilokarynosis and dyskeratosis varied. In most instances the intercellular bridges of the proliferated cells were well preserved. In cases 3 and 5 the tendency to infiltrative growth was much greater than in the usual cases of Bowen's disease.

15. Inglis, K.: Paget's Disease, New York, Oxford University Press, 1936.

16. Brighton, G.; Altmann, F., and Hagan, C.: Reaction of Laryngeal Tissues Following Extended Fractional Roentgen Irradiation, Arch. Otolaryng. **33**:631 (April) 1941.

In 1 of the described cases, case 6, the mitotic activity was particularly great. One feature was common to all: the intraepithelial spread. Within the stratified squamous epthelium this spread took place by proliferation of the epithelial cells in situ, and not by infiltrative growth of the neoplastic cells into the normal epithelium. The tumors which showed some, but not all, the histologic characteristics of Bowen's disease were called superficial squamous cell epitheliomas of the bowenoid type.

The question of the relationship between Bowen's disease and bowenoid lesions is still open. From the purely histologic viewpoint these conditions unquestionably belong together. There is a gradual, but not an essential, histologic difference between typical Bowen's disease (cases 1 and 2), frank cancer with Bowen lesions at the periphery (case 3), lesions with some characteristics of Bowen's disease (cases 4 and 5) and lesions with the same type of intraepithelial spread but without the cellular characteristics of Bowen's disease (case 6).

We feel that the intraepithelial spread is a much more important characteristic in all these cases than the degree of dyskeratosis and poikilokarynosis and that it should be regarded as the decisive factor in grouping these cases together. According to Inglis,[15] cancers originating in the surface epithelium can be divided into two groups. In one group the advancing margin, except in the very early stages, is everywhere definitely cancerous. The cancers belonging to the other group advance along the surface epithelium with a "precancerous" margin, though in the frankly malignant portions of the growth the advancing margin is definitely cancerous. "Precancerous" in this connection means a neoplastic proliferation of the squamous epithelial cells in situ, spreading along the surface by opposition and involving the covering epithelium as it goes, but not breaking through the basement membrane. Such epithelial proliferations have been observed, with or without infiltrative and frankly carcinomatous changes in the central parts, in various locations: the skin, the upper part of the digestive tract and the lower part of the female and male genital tracts. In this paper 2 cases (4 and 6) have been reported with a laryngeal localization. In some of the cases the "precancerous" condition showed characteristics of Bowen's disease. Ewing [17] described intraepidermal noninvasive "precancerous" lesions of the cervix uteri which histologically were similar to those observed in Bowen's disease of the skin. According to Ewing, these lesions are malignant and will eventually develop into clinical cancer. There is no essential difference between the purely intraepithelial lesions and lesions with actual infiltrative growth. The intraepithelial lesions are potentially malignant.

17. Ewing, J.: Neoplastic Diseases, ed. 4, Philadelphia, W. B. Saunders Company, 1940.

From a clinical viewpoint the separation of Bowen's disease and bowenoid lesions might still be justified, but even here the opinions of the authors differ. Montgomery [18] stated that he adhered to the concept of Bowen's disease as given by Bowen in his original paper and distinguished sharply between Bowen's disease which presents not only the histologic but the clinical features of the disease, such as solitary lesions with arciform configuration or multiple lenticular plaques, and conditions with a similar, or even undistinguishable, histologic picture, such as is present in many cases of senile keratosis and keratosis caused by roentgen rays, tar and arsenic. Histologically lessions of the latter type are epitheliomas in situ, eventually developing into penetrating epitheliomas in 20 per cent or more of cases. In addition, some ordinary squamous cell epitheliomas of the mucous membranes and other tissues present the histologic features of Bowen's disease.

According to Eller,[19] Bowen's disease, Queyrat's erythroplasia, Poget's disease and multiple flat superficial epithelioma, all previously considered separate pathologic entities, belong to the same group of changes. It might be mentioned that many authors regard Paget's disease of the nipple and extramammary Paget's disease as primary cancer of the lactiferous ducts and the excretory ducts of apocrine sweat glands, respectively (Weiner [20]), with secondary spread into the surface epithelium. If this interpretation is correct, they should not any longer be included in this group. Eller accepted Goldsmith's [21] opinion that Bowen's disease is only a histologic concept and is no longer looked on as a clinical entity; he concluded:

> In presenting the clinical picture of Bowen's disease one finds it difficult to give characteristics which are essentially different from those of certain superficial flat epitheliomas. In the future, when further investigation reveals more consistent findings, all the superficial carcinomatous changes will probably be united in one clinical concept. At the present time, however, morphologic terminology does not allow Bowen's disease to be eliminated from the nomenclature as long as there are no better criteria known for distinction.

In the mucous membranes the clinical differentiation of Bowen's disease and bowenoid lesions is still more difficult than in the skin, and sometimes even impossible. In 1 of our cases of Bowen's disease (case 1) the picture was more characteristic and was represented by a red, velvety, erythoplasia-like patch ("erythroplakia") in the nasal mucosa. In case 2 the clinical diagnosis was impossible. The bowenoid lesions

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18. Montgomery, H.: Arsenic as Etiologic Agent in Certain Types of Epithelioma: Differential Diagnosis from, and Further Studies, Superficial Epitheliomatosis and Bowen's Disease, Arch. Dermat. & Syph. **32**:218 (Aug.) 1935.
19. Eller, J. J.: Tumors of the Skin, Philadelphia, Lea & Febiger, 1939.
20. Weiner, H.: Am. J. Cancer **31**:373, 1937.
21. Goldsmith, W.: Proc. Roy. Soc. Med. **25**:1033, 1932.

showed uncharacteristic pictures (smooth or granular nodules of more diffuse thickenings). In view of the fact that Bowen's disease of the mucous membranes becomes frankly malignant fifty to twenty times as frequently as the disease of the skin, the clinical differentiation of Bowen's disease and bowenoid lesions in the mucosa is of much less prognostic importance than in the skin. In spite of the fact that Bowen's disease frequently responds favorably to radiation (Hazen and Whitmore [22]), scalpel excision or electrosurgical destruction is the therapeutic method of choice (MacKee [23]). Cipollaro and Foster [9] recommended postoperative irradiation and emphasized that the lesions should be treated adequately and radically at the very start. Improper treatment may activate a relatively benign process into a malignant one.

In cases of squamous cell epithelioma irradiation therapy gives good results and, particularly in the skin, has certain advantages over surgical treatment. It still remains to be seen whether bowenoid lesions react more favorably to irradiation than does Bowen's disease.

As long as this question remains undecided, bowenoid lesions of the mucosa should be treated in the same way as outspoken Bowen's disease. In both the cases of Bowen's disease reported in this paper the results seem to be satisfactory, though they were not followed up for long enough a period to permit final judgment.

Case 2 requires special mention. Here the lesion was removed by a simple endolaryngeal procedure, instead of by laryngofissure, in which a much larger area of the surrounding tissue could have been removed. Fourteen months after the last removal there had been no recurrence. Nevertheless, the patient has to be kept under constant clinical supervision, in view of the malignant potentialities of the lesion, and more radical treatment must be instituted immediately if indicated.

In 3 cases the bowenoid lesions were removed surgically, in 1 case with electrocoagulation, and the results apparently were favorable. It must be noted, however, that the cases have not been followed up over long enough a period to permit final judgment.

The 2 cases of Bowen's disease were found in men 70 and 71 years of age. This is in accordance with the fact that in the majority of the published cases the patients have been older than 45. The bowenoid lesions were also found in older people, 3 in men aged 53, 58 and 68, respectively, and 1 in a woman aged 59.

The fact that we observed 6 cases within a limited period tends to confirm the opinion of Cipollaro and Foster that Bowen's disease, and we may add superficial squamous cell epithelioma of the bowenoid type,

22. Hazen, H., and Whitmore, E.: Am. J. Roentgenol. **13**:144, 1925.

23. MacKee, G.: X-Rays and Radium in the Treatment of Diseases of the Skin, ed. 3, Philadelphia, Lea & Febiger, 1938.

more frequently involve the mucous membranes than has heretofore been believed. When the peculiar histologic pictures of these conditions become more generally known, their diagnosis unquestionably will be made more frequently.

SUMMARY

Two typical cases of Bowen's disease of the mucous membrane, one involving the anterior part of the nasal septum and the other the vocal cord, and 4 cases of squamous cell epithelioma with intraepithelial spread are reported. In the latter case some, but not all, the characteristics of Bowen's disease were presented. They were called instances of superficial squamous cell epithelioma of the bowenoid type. In 2 cases the lesion involved the larynx, in 1 the tonsils and the pharyngeal mucosa and in 1 the oral mucosa.

The relations between Bowen's disease and bowenoid epithelioma of the mucous membrane are discussed, and it is pointed out that histologically the two lesions are closely related and belong to the same group of changes.

The changes described in this paper are apparently more common than has heretofore been believed.

580 Park Avenue.

10 East Eighty-Fifth Street.

Symposium of Case Reports

GANGLION CELL NEUROMA OF THE PHARYNX

JOHN H. FOSTER, M.D., HOUSTON, TEXAS

REPORT OF A CASE

On Jan. 27, 1941 Miss S., aged 22, white, consulted me on account of a mass on the posterior wall of her throat. She had noted it for some time, but as it did not inconvenience her, she had neglected to consult a physician until it became rather large. Her general health was excellent, and her family physician said that there was no other abnormality.

Examination.—A prominent swelling occupied the whole left side of the posterior wall of the pharynx. The tumor was smooth and firm and about 2 inches (5 cm.) long, extending from slightly above the palatal border almost to the level of the epiglottis.

The patient had consulted Dr. H. M. Janse, another otolaryngologist in Houston, previous to coming to me. I got in touch with Dr. Janse, who stated that he had thought the tumor might be a cyst and had tried to aspirate the contents but had recovered only a few drops of fluid. This had had no influence on the size of the tumor. It was my impression that the growth was probably a lipoma, as I had encountered 2 cases of such a tumor in this location.

I advised removal of the tumor, and Dr. Janse requested me to operate, which I did, with his assistance. No tissue was removed for biopsy, as the mass seemed distinctly circumscribed and encapsulated.

Operation.—On February 7, with the patient under general anesthesia, the tumor was exposed through a vertical incision through the overlying tissue on the posterior wall of the pharynx. The growth was easily shelled out, being adherent only posteriorly. There was no bleeding requiring even the use of a hemostat. When the large oval mass was removed, the tail-like appendage shown in the drawing was seen for the first time and was removed. The tumor was not adherent at any place and was easily dissected out. The wound was closed with catgut sutures.

Course.—After the operation there was some swelling of the left side of the throat and neck for a few days, but no fever or other evidence of infection. Two days after the operation the patient complained of the left eye's feeling strange. Examination revealed a typical Horner syndrome, and, having by that time received the pathologist's diagnosis of ganglion cell neuroma, I wondered whether the superior cervical ganglion might not have been included in the tumor. However, these manifestations cleared up in a few days, and convalescence was uninterrupted. Examination a short time prior to making this report showed the pharynx to be smooth, with no sign of recurrence.

Pathologic Report (Dr. Violet Keiller).—Gross Observations. The specimen consisted of a bean-shaped tumor, measuring 5.5 by 4.5 by 2 cm., and a long

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Read at the Sixty-Fourth Annual Meeting of the American Laryngological Association, Atlantic City, N. J., May 26, 1942.

strand 1.5 cm. wide, 8 cm. long and about 0.5 cm. thick, the surface of which was more fibrous.

Section through the larger mass showed a soft, edematous layer with a tendency to circular arrangement of the fibers. This layer varied from 3 to 4 mm. in thickness. Within it was a more compact mass with white and yellow areas throughout.

Microscopic Observations: The smaller tumor showed fibrous tissue, with numerous bundles separated by loose, edematous tissue. The outer layer of the larger tumor had a similar structure. The inner, more compact, mass had numer-

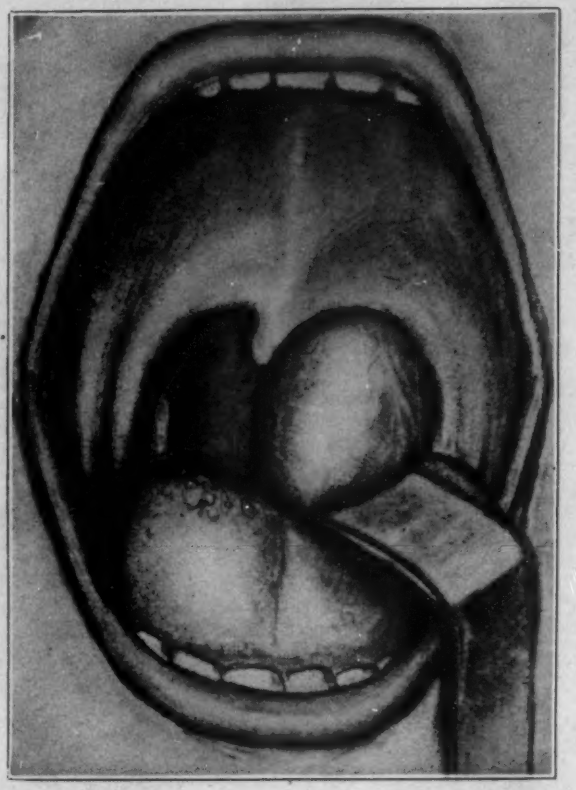

Fig. 1.—Drawing showing appearance of a tumor on the posterior wall of the pharynx.

ous ganglion cells, both scattered and in groups. Some areas had almost the precise appearance of small sympathetic ganglia. There was no evidence of active growth; the tumor was therefore diagnosed as benign. Preparations with special neurologic stains are being made. The tumor is a perfect example of its class.

COMMENT

It is probable that nerve tissue tumors of the pharynx are not as rare as a review of the literature seems to indicate. Unfortunately, such

tumors are often removed and not submitted to a competent pathologist for examination; again, many rare and interesting cases fail to be reported. However, ganglioneuromas in any situation are unusual and

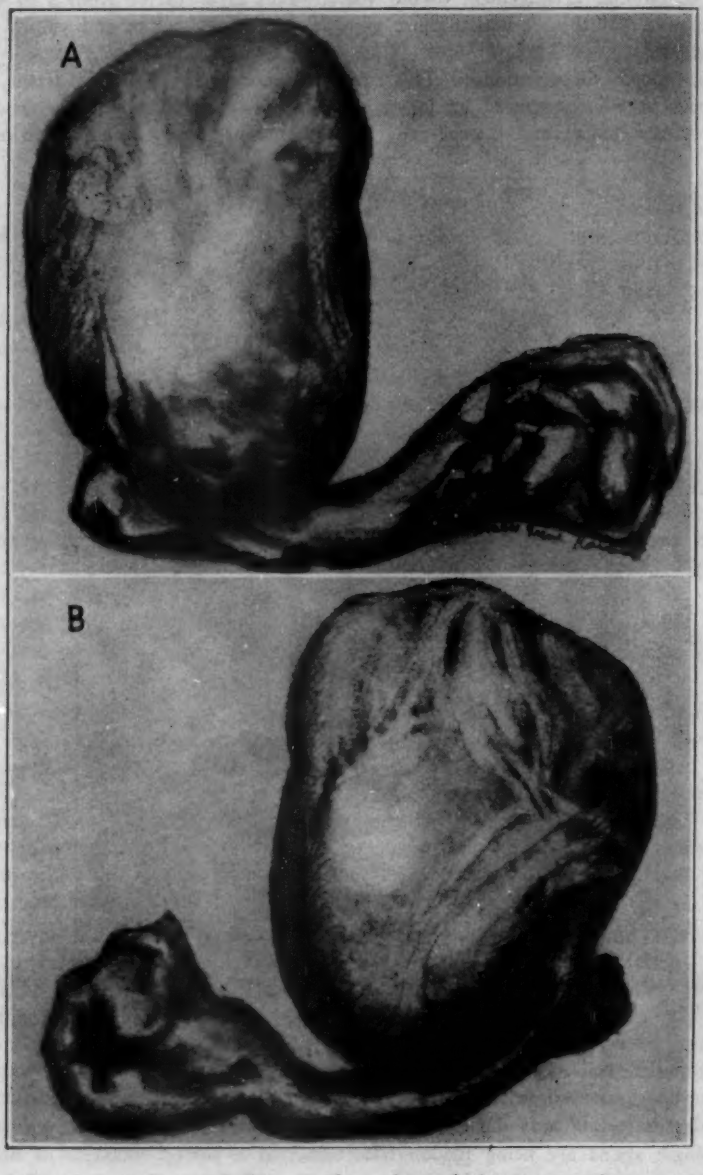

Fig. 2.—*A*, anterior, and *B*, posterior, view of the tumor after removal.

in the pharynx must be extremely rare. I have been unable to find a case in the literature in which the ganglion cell structure present in this case was described.

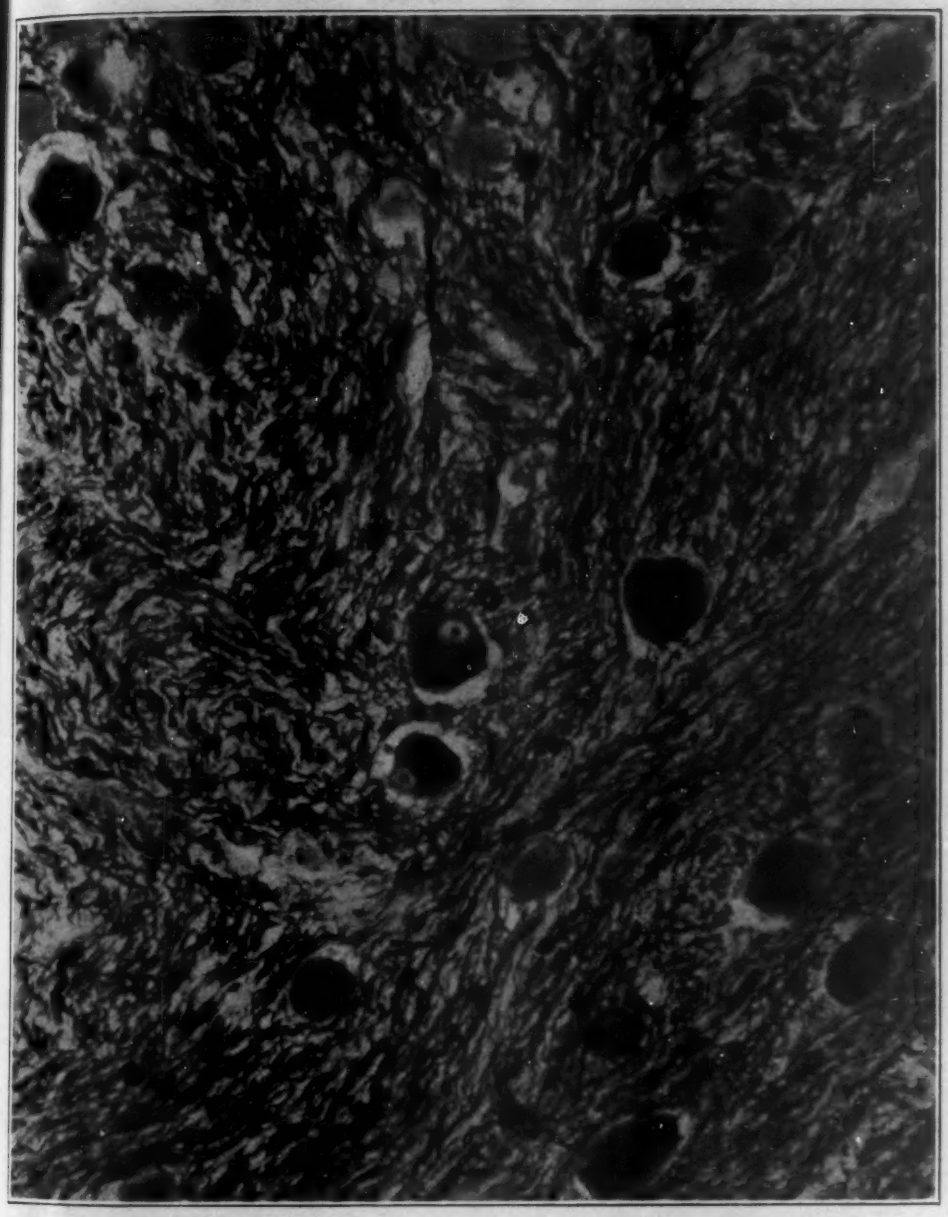

Fig. 3.—Section showing appearance of the tumor under low magnification. Ransom gold stain.

In 1933 Figi [1] reported a solitary neurofibroma of the pharynx. In 1941 2 cases were reported, 1 by Motley [2] and 1 by Hall and Owens.[3]

1304 Walker Avenue.

1. Figi, F. A.: Solitary Neurofibroma of Pharynx, Arch. Otolaryng. **17**:386 (March) 1933.

2. Motley, F. E.: Position Malignancy, Arch. Otolaryng. **34**:771 (Oct.) 1941.

3. Hall, C., and Owens, H.: Solitary Neurofibroma of Pharynx, Arch. Otolaryng. **34**:1163 (Dec.) 1941.

AMYLOID TUMOR OF THE LARYNX

LOUIS H. CLERF, M.D., PHILADELPHIA

Isolated amyloid tumor of the larynx is not common. According to Ewing, "extensive amyloid degeneration appears to overtake fibromas, chondromas, occasionally sarcomas, and some chronic productive inflammatory processes, so that the cellular structure is almost completely replaced by bulky masses of amyloid." Involvement of the air passages is not uncommon. Cases have been reported of the occurrence of such a tumor in the larynx, the trachea, the base of the tongue and the nares. The most common sites are the larynx and nares. In amyloidosis, commonly associated with prolonged suppuration, the distribution often is widespread.

The following case is of interest since it represents an isolated amyloid tumor unassociated with demonstrable local disease or generalized amyloidosis and suggests the idiopathic form.

REPORT OF A CASE

History.—A man aged 48, a locomotive inspector, had had a husky voice for many years. After a cold, three years before admission to the clinic, he became definitely hoarse.

His family and personal medical histories were essentially without significance. Although his larynx had been examined at frequent intervals and he had been attending a tumor clinic and had received radiation therapy, no diagnosis had been made. On admission to the bronchoscopic clinic there were marked hoarseness and some dyspnea on exertion.

Examination.—Mirror examination of the larynx revealed generalized congestion of the mucosa of the entire larynx, with prominence of both ventricular bands, particularly the right. This interfered with a satisfactory view of the vocal cords (fig. 1). The edge of the right cord exhibited a lobulated, papillary appearance, and the edge of the left cord also showed some irregularity. There was some impairment of motility of the right arytenoid cartilage. General physical examination and roentgenographic studies of the chest revealed nothing abnormal. The blood was normal. Tomographic studies of the larynx revealed a large solid tumor of the right ventricular band, which encroached on the glottis.

Direct laryngoscopic examination was performed, and tissue from the edge of the right vocal cord was secured for study. While the histologic appearance suggested fibroma, there were present small masses of amyloid material. Further examination revealed that the ventricular swelling was firm, but not of the consistency of bone or cartilage, and aspiration of material yielded nothing significant.

Operation.—On the basis of these observations thyrotomy was performed, with local anesthesia. The mass was firm and slightly nodular and extended from the right arytenoid cartilage to the base of the epiglottis, obliterating the ventricle and apparently involving the right vocal cord. An incision was made along the full

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length of the ventricular band, and a firm, pinkish tumor was encountered. It was definitely encapsulated and was readily separated from the surrounding tissues and the thyroid cartilage. Along the lower border anteriorly it seemed intimately

Fig. 1.—Enlarged prints made from a 16 mm. Kodachrome cinematograph taken by mirror laryngoscopy two months before thyrotomy, showing the tumor occupying the position of the right ventricle (*A*). The prominence of the interarytenoid tissues (*B*) is the result of edema.

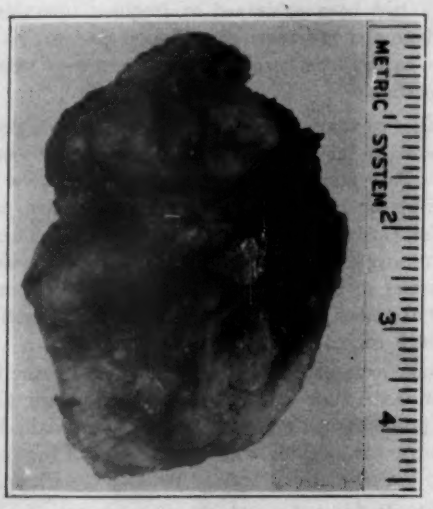

Fig. 2.—Tumor removed by laryngofissure, which was pinkish gray, measured 4 by 3 by 1 cm., was lobulated and firm and appeared well encapsulated.

adherent to the vocal cord. In addition, several of the small papillary elevations on the edge of the left vocal cord were removed for study. There was little bleeding. The wound was closed, and the patient made an uneventful recovery.

Fig. 3.—Photomicrograph (× 100) of an amyloid tumor. Histologic studies revealed large masses of amyloid material, which stained well with congo red. These were separated into alveoli by thin strands of fibrous tissue, containing numerous blood spaces. In some areas a few foreign body giant cells were observed (Dr. C. J. Bucher).

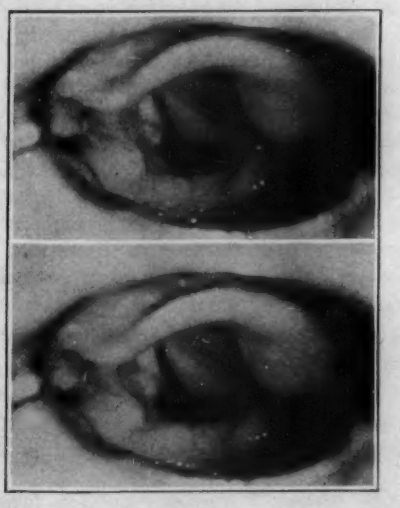

Fig. 4.—Enlarged prints made from a 16 mm. Kodachrome cinematograph taken by mirror laryngoscopy one year after removal of the tumor from the right side of the larynx by thyrotomy, revealing a normal right vocal cord. The left ventricular band and the left vocal cord now are greatly enlarged and are the site of tumor.

Pathologic Study.—The tumor was pinkish gray, measured 4 by 3 by 1 cm., was firm and lobulated and appeared well encapsulated (fig. 2). Histologically it exhibited large areas of hyaline material separated by fibrous septums. A few areas contained foreign body giant cells (fig. 3). The hyaline material stained well with congo red.

The diagnosis was amyloid tumor of the larynx.

The tissue removed from the left vocal cord presented evidences of amyloid change.

Postoperative Course.—The patient has been observed frequently since the operation, over one year ago, and is free from dyspnea. Hoarseness persists. The right ventricular band is of normal contour; the vocal cord is readily visible and appears smooth but thickened. The motility of the right arytenoid cartilage is normal. During this time the left ventricular band has slowly increased in size and now extends almost to the midline and involves the left vocal cord. Posteriorly a prominence corresponds to the tip of the vocal process (fig. 4). There is no ulceration. There can be little question concerning the character of this lesion, and the patient has agreed to its removal at a later date.

1530 Locust Street.

SEPTIC THROMBOPHLEBITIS OF THE NECK

Report of a Case with Serious Complications

SAMUEL IGLAUER, M.D., CINCINNATI

Septic thrombophlebitis of the cervical veins constitutes one of the most serious and dreaded complications of infectious processes in the neck. Fortunately, this complication is of rather infrequent occurrence, and the outcome depends in a large measure on the early recognition and the prompt employment of proper surgical and medical procedures.

In the following rather typical case the process was one of extreme severity associated with numerous complications, for the relief of which a whole series of surgical procedures was found necessary.

The combined surgical and chemical therapy probably accounts for the recovery of the patient.

REPORT OF CASE

History.—J. Mc., a white woman aged 32, was admitted to the medical service of the Cincinnati General Hospital on March 19, 1941. The patient was somewhat irrational and disoriented.

Past History.—According to her brother, there was a record of frequent attacks of quinsy. About two years before she had had pneumonia, with an uneventful and speedy recovery.

Present Illness.—The illness began two weeks prior to admission, when she contracted a severe sore throat. One week later she had a severe chill (thirty to forty minutes), and there had been about two chills on each succeeding day, associated with fever and delirium most of the time.

Physical Examination.—On admission to the hospital the temperature was 105 F., the pulse rate 120 and the respiratory rate 40 per minute. There was a definite icteric tint to the skin and scleras. Herpes labialis was present. The right shoulder joint was painful and tender.

There were clinical and roentgenographic signs of consolidation in the lower part of the left lung. The border of the liver was palpable and tender.

The provisional diagnosis was (1) lobar pneumonia, (2) septicemia, (3) acute tonsillitis and (4) hepatitis.

March 21: After consultation, the patient was transferred to the otolaryngologic service. At this time both tonsils were observed to be inflamed, with enlargement of the left tonsil, particularly at its superior pole. There was a tender, indurated area along the entire medial border of the left sternocleidomastoid muscle.

Diagnosis.—These local findings, together with the history and other data, led to a provisional diagnosis of thrombosis of the left internal jugular vein with metastatic foci in the lung and shoulder.

First Operation.—On the same day, with the use of procaine infiltration combined with left cervical block, an incision was made along the anterior border of the left

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From the Department of Otolaryngology, University of Cincinnati College of Medicine.

Read at the Sixty-Fourth Annual Meeting of the American Laryngological Association, Atlantic City, N. J., May 27, 1942.

sternocleidomastoid muscle from the angle of the mandible to the sternal notch. During blunt dissection at the level of the upper border of the thyroid cartilage, a gush of creamy pus (8 cc.) was encountered. This was observed to be exuding from an open vein, which was then followed down the neck for about 8 cm. The entire vein, apparently the anterior jugular, contained pus and no blood.

The internal jugular vein was then exposed in its middle third and was found to be intact, but it was doubly ligated and divided as a prophylactic measure to prevent further metastatic infection. There was free bleeding from a jugular branch, which was controlled by suture. The wound was left wide open and packed with gauze. Pus taken from the infected vein was cultured.

Postoperative Course.—The patient showed slight improvement, but the temperature remained high, reaching 107 F. (rectal) after one of the daily chills. Signs of consolidation appeared in the bases of both lungs. The left tonsil was injected and contained debris and was displaced almost to the midline.

Second Operation (March 25).—With the patient under anesthesia induced with intratracheal insufflation of cyclopropane, the left tonsil was dissected out. A gush of pus occurred as the tonsil was being removed. Through a small incision below the angle of the jaw, the parapharyngeal space was entered by blunt dissection, but no pus was encountered in this region.

Laboratory Examination.—Cultures of the pus from the thrombosed vein contained hemolytic streptococci. All of several blood cultures failed to yield any growth. The leukocyte counts were high (16,000 to 30,000). The icteric index and the levels of sulfonamide compounds in the blood were controlled. Chemotherapy with sulfathiazole (2-[paraaminobenzenesulfonamido]-thiazole) was started on the first day in the hospital and was continued for four days, when sulfadiazine (2-[paraaminobenzenesulfonamido]-pyrimidine) was substituted. The latter drug was administered for the succeeding four weeks. Numerous roentgenograms were taken throughout the course of the disease.

During the next ten days the temperature declined, and the patient showed decided improvement, but the signs of bilateral pneumonitis with effusion in the left side of the chest persisted. The patient also began to expectorate foul pus, and a pulmonary abscess (right side) associated with empyema was suspected. A diagnostic chest tap on April 17 yielded frank creamy pus with a putrid odor.

At this time the patient was transferred from the medical to the surgical service.

Third Operation (April 17; Dr. Hoppie Siler).—Open thoracotomy on the right side, with resection of the seventh and eighth ribs posteriorly, was performed, and an enormous empyema cavity combined with a bronchopleural fistula was encountered and drained.

Fourth Operation (April 22).—Closed thoracotomy for empyema on the left side of the chest was performed. The aspirated pus (250 cc.) contained staphylococci and streptococci.

Fifth Operation.—Drainage on the left side was not considered adequate with the closed system, and on May 19 open thoracotomy with Schede unroofing was done on that side.

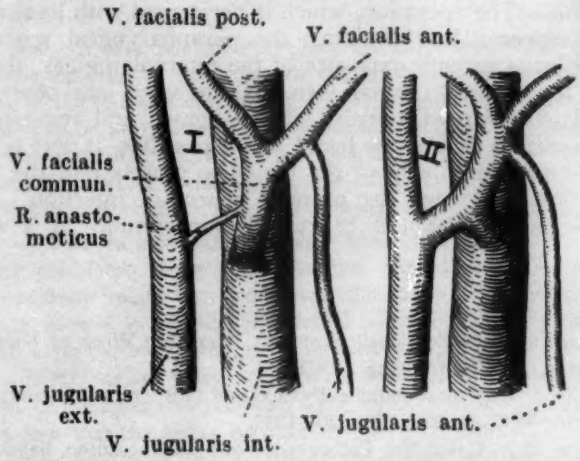
Course.—After these open drainage operations, the patient gradually improved, but did not become afebrile until the end of the month.

Subsequent Operations.—On June 27 a more extensive unroofing was done on the left side, and on July 7 the unroofing on the right side was extended. In August the opening on the left side and in September that on the right side were closed

by plastic repair, and the patient, in excellent health, was ready for discharge from the hospital.[1] She had been in the hospital for one hundred and thirty-three days, during which time she had undergone nine operative procedures.

COMMENT

Clinical Features.—The history in this case was typical. The usual history obtained is that a week or more after tonsillitis or quinsy high fever, repeated chills and sweats develop. Tenderness below the angle of the jaw is a constant sign, and swelling may appear in the same region. There may be tenderness and some induration along the course of the internal jugular vein. The tonsillar inflammation may have completely subsided, but in rare instances a discharging fistula from a peritonsillar abscess may still be present. The tonsil and the lateral pharyngeal wall on the affected side may be somewhat displaced toward



Drawings showing unusual connections of the anterior jugular vein in (*I*) with the anterior facial and in (*II*) with the common facial vein. These diagrams demonstrate the possible pathway of extension of a thrombus from the common facial into the anterior jugular vein (modified from Tandler [6]).

the median line. Later in the course of the disease there may be signs of pleurisy or minute emboli in the lungs.

Pathogenesis.—The avenue of infection from the tonsil is usually by way of the lymphatics and tissue spaces, giving rise to periphlebitic leukocytic infiltration, followed by septic phlebitis of the regional venules or veins (Uffenorde,[2] Waldapfel,[3] Joël [4] and others). The thrombosis

1. At this time a campaign for a bond issue for the hospital was in progress, and the patient was able to broadcast over the radio urging the voters to approve the issue.

2. Uffenorde, W.: Die Verwicklungen der akuten Halsentzündung, Leipzig, Curt Kabitzsch, 1925.

(Footnotes continued on next page)

usually involves the posterior facial, the common facial and, finally, the internal jugular vein (Anders[5]).

Involvement of the anterior jugular vein, as reported in this case, is unusual, since this vein has no direct relation to the tonsillar fossa. However, as shown by Tandler[6] (figure), there may be a connection between the anterior jugular and the common facial vein, which was the probable pathway of infection in my case. Voss[7] reported a case of similar involvement of the anterior jugular vein, and I have seen 1 case of thrombosis of the external jugular vein.

Prognosis.—Without surgical intervention, according to Claus[8] the termination is usually fatal. In 20 (46 per cent) of his first operative series of 43 cases the patient succumbed to the disease despite operation. In a later report on 100 cases Claus stated that the mortality in more recent cases was between 20 and 30 per cent. Voss's[9] statistics showed a mortality of 22.2 per cent.

Operation.—The operation, which is performed with local anesthesia, consists in opening and draining the parapharyngeal space through an external incision, with exposure of the internal jugular, the common facial and the posterior facial vein. If the veins are observed to be thrombosed or collapsed, they should be ligated and removed and the exploration carried as near the tonsil bed as possible. It may be necessary to sever the posterior belly of the digastric muscle and the stylohyoid muscle in order to reach the primary source of infection. The tonsil on the affected side should be removed, preferably at a subsequent operation.

707 Race Street.

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3. Waldapfel, R.: The Tonsil Problem: Research Work of Viennese Clinic, Arch. Otolaryng. **8**:127-137 (Aug.) 1928.

4. Joël, W.: Ueber postanginöse Pyämie und ihre Verbreitungswege, Deutsche med. Wchnschr. **55**:2133-2135 (Dec. 20) 1929.

5. Anders, H.: Ueber die Pathogenese der postanginösen Sepsis, Ztschr. f. Hals-, Nasen- u. Ohrenh. **29**:408-410 (Sept.) 1931.

6. Tandler, J.: Lehrbuch der systematischen Anatomie, Leipzig, F. C. W. Vogel, 1926, vol. 3, p. 259.

7. Voss, O., in discussion on Claus,[8b] Ztschr. f. Hals-, Nasen- u. Ohrenh. **29**: 414 (Sept. 23) 1931.

8. (*a*) Claus, H.: Ueber 100 Fälle Septico-Pyämie nach Angina, Med. Klin. **27**:1269-1271 (Aug. 28) 1931; (*b*) Die von uns bei der Beobachtung von nunmehr 100 Fällen von schwerer Pyämie nach Angina gewonnenen Gesichtspunkte, Ztschr. f. Hals-, Nasen- u. Ohrenh. **29**:404-407 (Sept. 23) 1931.

9. Voss, O.: Pyämie nach Angina, Med. Klin. **27**:1550, 1931.

OSTEITIS FIBROSA CYSTICA OF THE LEFT FRONTAL SINUS

Report of a Case

JOHN D. KERNAN, M.D., NEW YORK

REPORT OF CASE

A woman aged 21, a Puerto Rican, was admitted to the Vanderbilt Clinic complaining of a large, firm swelling above the left eye. According to her story, she had first noticed the swelling a year before over the lower portion of her forehead. It had grown slowly downward until it had become most prominent at the inner canthus of the eye. At the same time she suffered from severe pain in that region and displayed changes in personality, becoming gloomy and addicted to fits of crying.

Examination.—A firm, nontender swelling was noted over the left frontal sinus, extending into the orbit on that side and displacing the eye outward. There was a firm mass in the left ethmoid region. Biopsy of the mass in the nose showed what appeared to be an osteoma. Roentgenograms revealed the swelling to be a cyst occupying most of the left frontal region and extending beyond the midline on the right side. Lateral roentgenograms showed that it extended deep into the frontal portion of the cranial cavity, compressing the frontal lobes of the brain.

Operation.—Two surgical attempts were made to remove this cyst, only the second being completely successful. The first was planned with the idea that the lining membrane might be removed and the cavity drained into the nose. It would then be allowed to fill with granulation tissue and the consequent deformity corrected by a plastic operation. A V incision was made in the forehead, the arms joining in midline and extending outward above the eyebrows. When the thin anterior wall of the mass was removed, some straw-colored fluid flowed out, and then it was seen that the lining was not that of an ordinary cyst but consisted of thick, friable masses of fibrous tissue, which bled profusely. All this was curetted away. The cavity had replaced both frontal sinuses and invaded both ethmoid regions. When the contents were all removed, a large opening was made into the nose. Examination of the tissue showed it to be osteitis fibrosa cystica. This operation was not a success. The cavity did not fill in with granulation tissue, and the opening into the nose closed.

The cyst was then totally removed in two stages. First, the old incision was reopened and the posterior wall partially removed, the dura being exposed over a considerable area. Profuse hemorrhage and shock forced discontinuation of the procedure. Later, through the same incision, the remaining portion of the cyst wall was removed with ronguers and biting forceps. It consisted of a layer of fibrous, brittle tissue with bits of bone in it, 1 cm. in thickness, lining a shell of porous bone. The entire dura covering both frontal lobes was exposed. The anterior end of the falx cerebri was exposed, and several ethmoid cells containing pus were opened. The region of the cribriform plate was composed of soft, necrotic material, and the crista galli was not identified. The dura was lacerated

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at one point, and there was free flow of cerebrospinal fluid. Hemorrhage was profuse, but for all this the entire roof of the right orbit, the posterior wall of both frontal sinuses and the roof of the left orbit were removed. The cavity was lightly packed with iodoform gauze and the wound partially closed with silk.

Postoperative Course.—In spite of the fact that the dura had been torn and pus was present in the ethmoid cells, the patient had a normal temperature after the third day, perhaps because sulfathiazole (2-[paraaminobenzenesulfonamido]-thiazole) was given at once. The wound healed rapidly, though with great

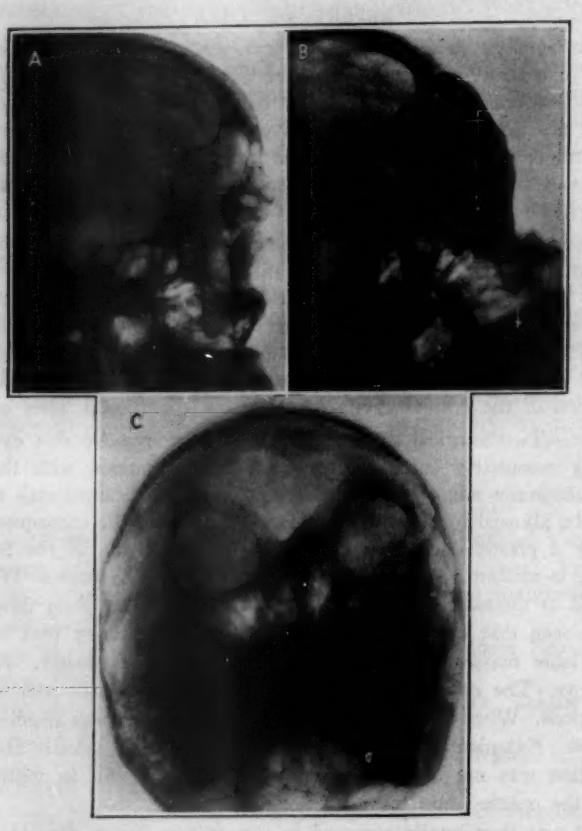

Fig. 1.—*A*, lateral roentgenogram showing extension of the cyst in the frontal part of the skull. *B*, lateral roentgenogram showing the cavity packed with iodoform gauze. The extension along the floor of the frontal fossa and the thickness of the posterior wall of the cyst should be noted. *C*, the bony defect in the frontal region after total removal of the wall of the cyst.

deformity. The patient is now to have plastic repair. An interesting result of the procedure is that the headaches have disappeared and her disposition is cheerful and happy.

Osteitis fibrosa of the frontal bones has been reported a number of times. This case is notable for the extent of the lesion.

Pathologic Report (Dr. Purdy Stout, Presbyterian Hospital).—"The lesion consisted of a proliferative growth of cellular fibrous tissue, associated with varying amounts of osteoid, spotty calcification and perhaps a little true bone. The osteoid

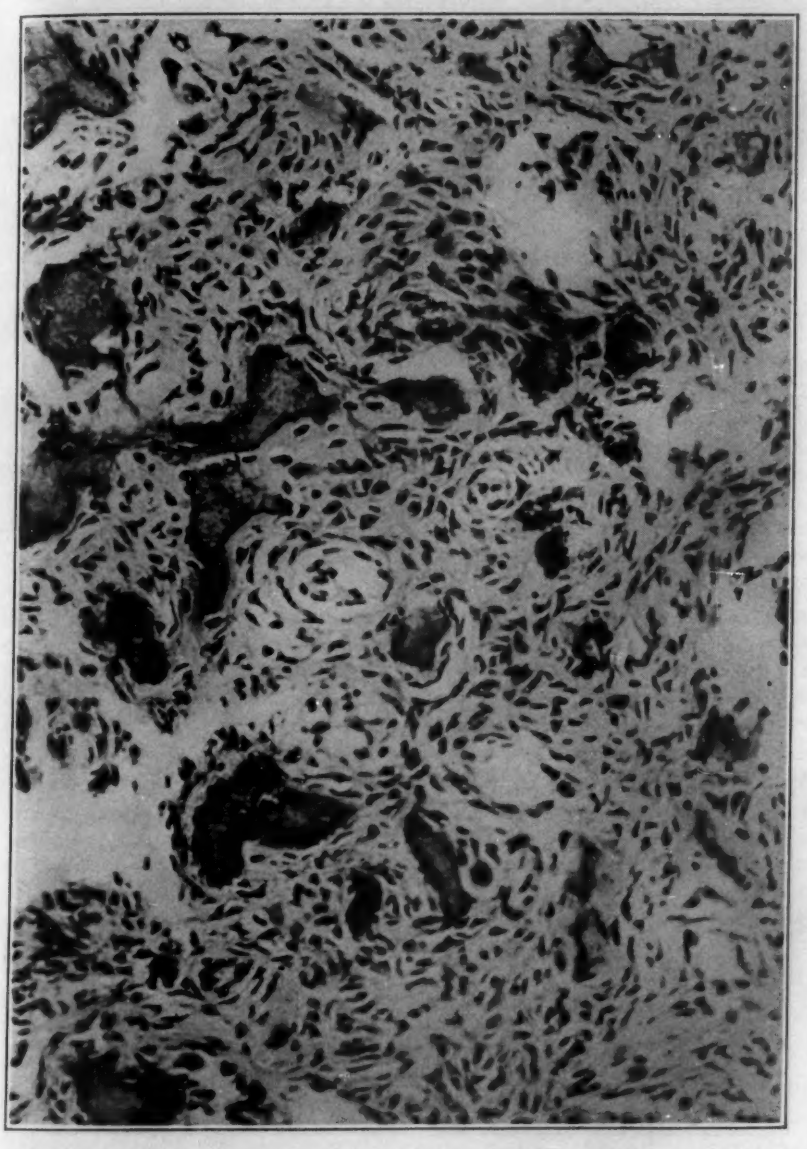

Fig. 2.—Photomicrograph of the lesion, showing its fibrous structure and islands of newly formed bone.

was often arranged in tiny rounded balls instead of in trabeculae. The growth of this tissue had occurred within cancellous bone and had been accomplished by both infiltration and expansion. This had resulted in pressure necrosis of pre-

existing bone, thus accounting for the areas of rarefaction. There was no inflammatory reaction except where the growth had approached the mucosa of the sinuses. What little was present could, therefore, be regarded as secondary and

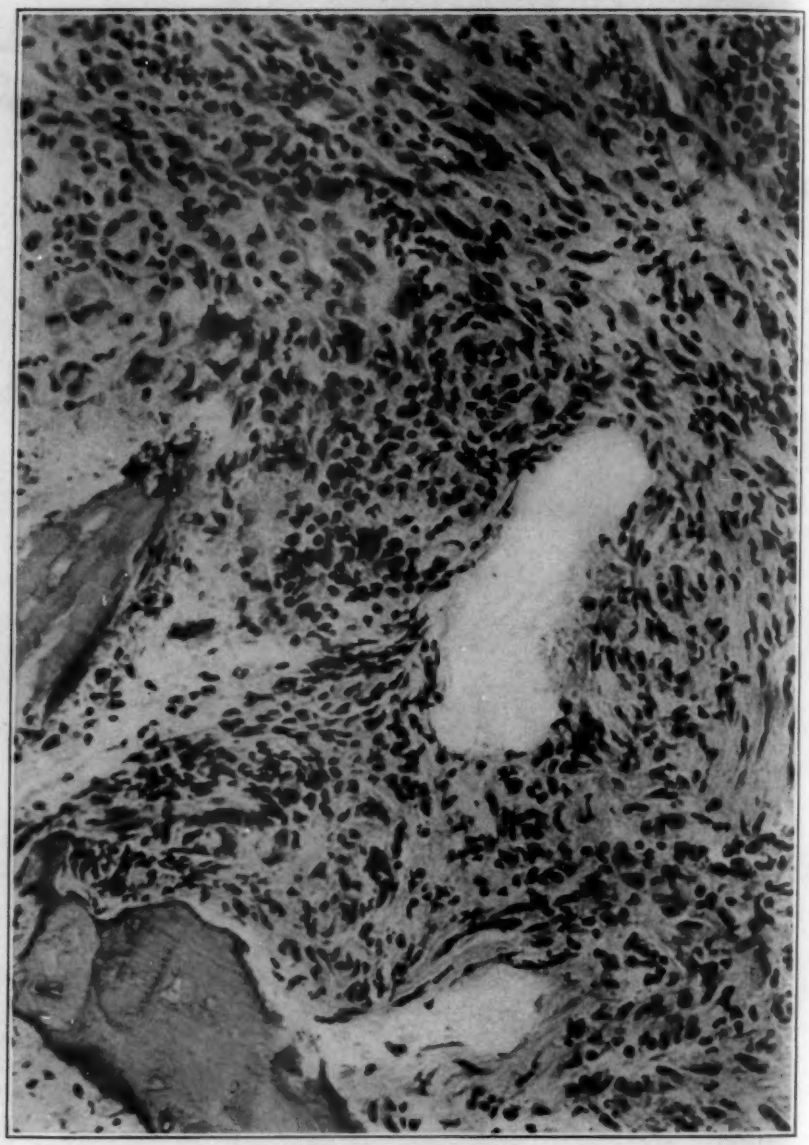

Fig. 3.—Photomicrograph at the border of the lesion, showing destruction of normal bone by absorption.

accidental. In some places the lesion was almost entirely fibrous. Elsewhere there were calcification, osteoid and bone formation and occasional small cysts. Much of the bone and osteoid was in the form of balls, although it appeared occasionally as trabeculae.

"Histologically the lesion could be interpreted as any one of the following growths: osteitis fibrosa, osteoid osteoma, osteofibroma or soft osteoma. In my opinion, there is not any real difference between these four tumors except in the varying amounts of bone, osteoid and fibrous tissue which enter into their makeup.

"*Osteitis Fibrosa.*—The amount of true bone containing mineral salts is negligible, the osteoid (that is, bone without mineral salts) is variable, but usually small, and the fibrous tissue predominates. Degeneration cysts and granulomatous areas with multinucleated giant cells (as in the so-called giant cell tumor) may or may not be present. These features have been established from a study of the lesions in multiple osteitis fibrosa due to hyperparathyroidism.

"*Osteoid Osteoma.*—This term was invented by H. L. Jaffe, in 1935, to describe a definite osseous lesion composed of fibrous tissue and osteoid which is sharply circumscribed and gives a recognizable roentgenographic picture. He expressed the belief that it was a benign neoplasm and comparable to an osteoma without mineral salts. I have not yet accepted this point of view. The lesion seems to me to be more in the nature of a variant of osteitis fibrosa.

"*Osteofibroma.*—This term is employed almost exclusively by dental pathologists to describe intraosseous fibrous growths of the mandible and maxilla, in which associated with the fibrous tissue in varying quantities are areas of calcification, ossification and osteoid formation. The bony and osteoid structure in these growths not infrequently occurs in the form of balls, which is reminiscent of cementum. In my experience, this type of growth is encountered only in the mandible and maxilla, so that there is perhaps some excuse for giving it a distinct name. Again, I have not accepted this lesion as an entity, but still consider it as a variant of osteitis fibrosa peculiar to the mandible and maxilla.

"*Soft Osteoma.*—This type of osteoma is peculiar to the upper jaw and adjacent bones of the face and orbit. It is just like an ordinary osteoma except that its bony trabeculae are poorly supplied with mineral salts, so that, although it casts a shadow in the roentgenogram, it is malleable and easily adjusts itself in its growth to the shape of the surrounding, less malleable tissue. Its narrow spaces are always filled with fibrous tissue.

"*Diagnosis.*—On clinical and roentgenologic grounds one can exclude soft osteoma in this case; this leaves the other three lesions as possibilities. I do not think Jaffe has recorded any instances in which his osteoid osteoma occurred in the jaw; so it may be wise to avoid the use of this term. This leaves the choice between osteitis fibrosa and osteofibroma. Since I believe osteofibroma is not an entity but simply a variant of osteitis fibrosa, I should call the lesion in this case osteitis fibrosa."

103 East Seventy-Eighth Street.

HISTOPLASMOSIS OF THE LARYNX

L. W. Dean Jr., M.D., St. Louis

REPORT OF CASE

A teamster, aged 41, became hoarse in May 1941. The hoarseness increased and at the end of four months severe cough, stridor and dyspnea were present on exertion, followed later by dysphagia, pain deep in the ears and generalized weakness. There was a loss in weight of 20 pounds (9.1 Kg.) during this period.

When first seen at Barnes Hospital in January 1942 (seven and a half months after the onset of the illness), the patient appeared poorly nourished; he was unable to speak above a whisper and was in mild distress, due to inspiratory stridor.

The epiglottis was thick, nodular and pale. It was tilted in a position preventing indirect examination of the larynx and encroached on the airway. Direct examination showed the whole interior of the larynx to be white and nodular. The false and true cords were involved to such an extent as to be entirely obliterated. The glottic chink was converted into an irregularly rounded tube.

There was a daily rise in temperature of about 1 degree (F.).

A presumptive diagnosis of keratosis of the larynx with carcinomatous change was made.

With use of the Lynch suspension, most of the epiglottis was amputated and tracheotomy performed.

Microscopic sections showed generalized keratosis with a greatly thickened tunica propria, infiltrated with plasma cells, lymphocytes and numerous multinucleated giant cells (fig. 1). Within the giant cells were oval bodies, about 3 microns in diameter and possessing a central nuclear body (fig. 2) and an outer thick refractile membrane. Dr. Morris Moore identified the organism as Histoplasma capsulatum.

Treatment consisted of daily intravenous injections of 5 cc. of fuadin (an antimony preparation) for one week, followed by two weeks of rest and then another week of fuadin injections. No effect on the larynx was noted.

Fractional irradiation of the larynx was given, but this therapy was stopped after twelve days because of uncontrollable pain in the ears and throat.

At the time this report is made there are a proliferative lesion of the skin about the tracheotomy wound, an ulceration on the knee and a large amount of granulomatous tissue in the trachea and the main bronchi, which on one occasion necessitated bronchoscopy to prevent suffocation. Microscopic sections of tissue from these sites showed histoplasmosis.

From Barnes Hospital and the Department of Otolaryngology, Washington University School of Medicine.

Read at the Sixty-Fourth Annual Meeting of the American Laryngological Association, Atlantic City, N. J., May 26, 1942.

Fig. 1.—Thickening of the epithelium and dense infiltration of the tunica propria with giant cells, plasma cells and lymphocytes. Low power.

Fig. 2.—Multinucleated giant cells containing many parasites (Histoplasma capsulatum) with a central body and outer refractile membrane. High power.

COMMENT

After Darling [1] first described this disease in 1906 in natives of Martinique few cases were reported until, in 1926,[2] a case was reported from Minnesota. More recently cases have appeared in the Middle West and the South, until the disease is no longer a rarity. It occurs in infants as young as 3 months,[3] as well as in persons of the other age groups.

Da Rocha-Lima,[4] De Monbreun [5] and Moore [6] have worked out the cultural characteristics and classification. The organism belongs in the family coccidioideaceae and is closely related to Rhinosporidium seeberi.

Lesions of the oropharynx are common and are granulomatous and ulcerative. Brown, Havens and Magath [7] and Parsons [8] have seen cases with lesions in the larynx similar to those in this case.

The disease is fatal. Therapeutic agents which have been used, without success, include potassium iodide, neoarsphenamine, sulfonamide compounds, pentnucleotide, sodium thiosulfate, antimony and roentgen rays.

University Club Building.

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1. Darling, S. T.: A Protozoön General Infection Producing Pseudotubercles in the Lungs and Focal Necroses in the Liver, Spleen and Lymphnodes, J. A. M. A. **46**:1283-1285 (April 28) 1906; Histoplasmosis: A Fatal Infectious Disease Resembling Kala-Azar Found Among Natives of Tropical America, Arch. Int. Med. **2**:107-123 (Sept.) 1908; The Morphology of the Parasite (Histoplasma Capsulatum) and the Lesions of Histoplasmosis, a Fatal Disease of Tropical America, J. Exper. Med. **11**:515-531 (July) 1909.

2. Watson, C. J., and Riley, W. A.: A Case of Darling's Histoplasmosis Originating in Minnesota, Arch. Path. **1**:662-667 (April) 1926.

3. Rhodes, P. H.; Conant, N. F., and Glesne, L. R. B.: Histoplasmosis: Report of a Case in an Infant Three Months of Age, J. Pediat. **18**:235-244 (Feb.) 1941.

4. da Rocha-Lima, H.: Beitrag zur Kenntnis der Blastomycosen, Lymphangitis epizootica und Histoplasmosis, Centralbl. f. Bakt. (Abt. 1) **67**:233-249, 1912.

5. De Monbreun, W. A.: The Cultivation and Cultural Characteristics of Darling's Histoplasma Capsulatum, Am. J. Trop. Med. **14**:93-126 (March) 1934.

6. Moore, M.: Posadasia Pyriformis and P. Capsulata, Two Causative Organisms of Darling's Histoplasmosis in the United States, Ann. Missouri Bot. Gardens **21**:347-348, 1934; A Morphological and Physiological Study of Two Species of Posadasia: P. Capsulata (Darling) Moore and P. Pyriformis, ibid. **22**:335-360, 1935.

7. Brown, A. E.; Havens, F. Z., and Magath, T. B.: Histoplasmosis: Report of a Case, Proc. Staff Meet., Mayo Clin. **15**:812-816 (Dec. 18) 1940.

8. Parsons, R. J.: Personal communication to the author.

Progress in Otolaryngology

Summaries of the Bibliographic Material Available in the Field of Otolaryngology

THE PARANASAL SINUSES

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(*Continued from page 291*)

SURGICAL THERAPY

General Considerations.—Sewell [130] states that there are two ways of surgically curing diseased sinuses: "obliteration" and "elimination." The former is accomplished by removal of the bony walls and their lining mucosa, which is replaced by other tissue, as may be the case in certain frontal and ethmoid procedures. By "elimination" he refers to the procedure by means of which a sinus is made incapable of retaining secretions, as would be the case with the sphenoid operation he devised, whereby the floor is completely removed. The author admits that whereas obliteration of the ethmoid sinuses is the result of the external operation, that is not advisable in the case of the frontal sinus and therefore it is necessary to provide for adequate drainage into the nose, which is possible only through thorough exenteration of the ethmoid sinuses. As for the Caldwell-Luc operation, he has seen numerous failures, despite use of the best technic by reputable surgeons, which he attributes to the organization of blood clots and the walling of small abscesses. To prevent such an unfavorable course he recommends a permanent fistula in the canine alveolar region through which the cavity may be inspected and treated during the postoperative course. He claims that in certain cases in which obliteration is impossible or not feasible the only course is to provide permanent adequate drainage in the most dependent portion of the sinus, as mentioned in the case of the frontal and sphenoid sinuses and the antrum.

Hollender [131] discusses the pessimistic attitude of many of the laity with regard to operations on the sinuses and the reasons therefor. Such an

130. Sewell, E. C.: Surgery of the Nasal Sinuses, Ann. Otol., Rhin. & Laryng. **50**:463 (June) 1941.

131. Hollender, A. R.: Fallacious Views Concerning Rhinologic Surgery and Factors Influencing More Successful Results, J. Florida M. A. **28**:26 (July) 1941.

attitude deprives many a sufferer of proper care and must be overcome by more careful attention to the general principles that should govern the selection of patients for operation as well as of procedure. Among the factors that must be considered are the physical status of the patient, the question of correct diagnosis, the thoroughness of the surgical technic and the postoperative treatment, local and general. It is important to remember that the principles governing the indications for operation in general surgical therapy apply with equal force to operations on the sinuses and that in every case the surgeon must consider the patient as a whole.

According to Matsui,[132] operations on the maxillary sinus still fail to yield sufficiently satisfactory results. However, if the operation is combined with opening of the ethmoid cells the results are much better. In some quarters it is claimed that usually there is an involvement of all the sinuses on the same side. The author feels that the ethmoid sinuses are in most cases the primary seat of the infection, and he therefore operates on them first and awaits the result before opening the remainder of the sinuses. He employs the Halle method and claims it is adequate, as proved by a number of illustrations showing the technic.

Hashizume [133] discusses the postoperative care of sinuses, particularly with reference to the prevention of crusting and removal of secretions.

Frontal Sinus.—Three articles by Zange and his associates [134] have to do with theories as to the role of pathologic changes in the nasofrontal duct in disease of the frontal sinus and with therapeutic measures to relieve the condition. Wullstein has found that with the simple catarrhal or vasomotor involvement in which the obstruction in the duct is more or less temporary, giving rise to vacuum headaches, relief may be obtained by forcible inflation of the nasal cavity after thorough shrinking of the middle turbinate and middle meatus. The author states that the entrance of air into the sinus is accompanied by a cool sensation in the forehead and prompt relief of the headache. Zange and Moser, on the other hand, feel that such a condition warrants external puncture of the sinus according to the method described by Beck, in which the

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132. Matsui, T.: Ueber die Operation bei chronischer Nasennebenhöhlenentzündung, Oto-rhino-laryng. **14**:539 (Aug.) 1941.

133. Hashizume, M.: Ueber die Nachbehandlung der Operationswunde der chronischer Nebenhöhlenentzündung, Oto-rhino-laryng. **14**:15 (April) 1941.

134. Zange, J., and Moser, F.: Der Ductus nasofrontalis bei Stirnhöhlenerkrankungen und das Becksche Punktionsverfahren in seiner Bedeutung für Diagnostik und Therapie, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **147**:114, 1940. Wullstein, H.: Wegsamkeitsprüfung und Luftung der Nebenhöhlenausführungsgänge, insbesondere des Ductus nasofrontalis mittels Luftdusche, ibid. **147**:139, 1940. Zöllner, F.: Zur Pathologie des Stirnhöhlenausführungsganges und über die Ursachen des Versagens der konservativen Behandlung von Stirnhöhleneiterungen, ibid. **147**:143, 1940.

opening is kept patent by means of a small cannula so that a solution of epinephrine hydrochloride may be instilled into the sinus from above to shrink the mucosal lining of the duct and thus establish its patency. Also, irrigations may be employed and if necessary astringent solutions. They state that the procedure has been successful in cases of both acute and chronic suppurative conditions as well as in cases in which the abscess has already broken through into the orbit. It is their contention that disease of the frontal sinus can usually be cured if the patency of the duct is established, since drainage and ventilation will restore the integrity of the mucosa in all but a small proportion of cases. The authors cite typical cases to support their argument and show roentgenograms by means of which they are able to prove that the pathologic changes center about and are most active in the region of the duct. Zöllner is concerned about the pathologic changes that may be found in and about the nasofrontal duct, which in many cases lead to complete stenosis and the formation of a mucocele or pyocele. He shows a number of histologic preparations which demonstrate not only that the mucosa lining the duct is involved to a greater degree than the rest of the sinus mucosa but also that the surrounding bone is frequently the seat of low grade osteomyelitic changes with attempt at healing, as evidenced by the formation of new bone in the shape of osteophytes. This newly formed bone may completely block the duct beyond the hope of repair by any conservative measure. He admits that in many cases when the pathologic process has not progressed too far the measures advocated by Beck and Zange may lead to a cure, and he advises trying them out before resorting to a more radical form of surgical intervention. There is some logic in the contention of all the authors that the duct is the seat of the most advanced changes because of its position and tortuous course and because of the fact that it runs through thick bone for the most part, thus differing from the ostiums of the other sinuses.

Mayer [135] describes a procedure to insure a wide and permanent communication between the frontal sinuses and the nasal cavity. It resembles the Lothrop operation in most of its details. The technic calls for complete removal of the floor of the frontal sinuses, the intersinus septum, the upper portion of the nasal septum and the superior nasal spine and thinning out of the anterior wall of the sinus. Since the deepest part of the frontal sinuses is in the midline, this procedure provides a canal which is in the midline and centers at the most favorable point for its permanent maintenance.

135. Mayer, O.: Ueber die Herstellung einer breiten Verbindung mit der Nase bei der Wegen chronischer Entzündung vorgenommen radikalen Stirnhöhlenoperation, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **148**:282, 1940.

Bergara [136] offers his own technic for the treatment of chronic suppurative frontoethmoiditis, which he recommends in cases in which endonasal procedures have failed. The procedure is osteoplastic; the bone flap with superimposed adherent periosteum is reflected downward at the supraorbital margin, having been formed by drill holes following the outline of the sinus. This exposes the interior of the sinus for whatever treatment may be required. The upper portion of the ascending process is removed and with it the agger cells, thus revealing the head of the turbinal. The ethmoid sinuses are cleaned out, and a probe in the nasofrontal duct acts as a guide for the widening of the duct. A drainage tube is sewed in place and kept there for twenty to thirty days. The bone flap is replaced, periosteum and skin sutured and drainage effected through the tube. The advantages of the operation are accessibility to the field and absence of postoperative cosmetic defect. A number of fine illustrations illuminate the article, which also reviews and examines similar osteoplastic procedures previously offered by other authors.

Lothrop [137] reviews the results of his operation after twenty-five years of experience. The pleasing results are: unnoticeable scar, lack of numbness of the area supplied by the supraorbital nerve and a patent duct permitting easy passage of a probe into the sinus. Another advantage is the fact that the nasal bone, lacrimal bone and ascending process are not disturbed, and hence there is no danger of soft tissues caving in and occluding the passage. The author advises preliminary removal of the anterior tip of the middle turbinate, cleaning out of the anterior ethmoid sinuses and allowing several months to elapse for complete healing before doing the external operation. This provides a clean scarred base in the nose for the spread of epithelium into the frontal sinus when it is opened. The floor of the sinus is not taken away, only the anterior wall and the mucous membrane. He sees no danger in the use of the special rasp if one is careful not to damage the lacrimal bone or to rasp medially when first starting the operation because of the proximity of the foramen caecum. The rasping is done in a forward and outward direction at first, the object being to remove the interior nasal spine. Care should be taken not to macerate the septal mucosa. In cases in which the condition is bilateral it is no longer necessary to remove the interfrontal septum. He advises separate incisions which are not extended externally as far as the supraorbital foramen. If granulation tissue should occlude the duct subsequently it is easily removed, and rereaming will always result in quick healing.

136. Bergara, R. A.: Tratamiento quirúrgico de la frontoetmoiditis crónica por el método osteoplástico, Buenos Aires, Alfredo Frascoli, 1940.

137. Lothrop, O. A.: An Evaluation of the Lothrop Operation on the Frontal Sinus, Arch. Otolaryng. **33**:73 (Jan.) 1941.

The operation should not be done until all symptoms of acute trouble have disappeared. The author finds the operation suitable for large as well as small sinuses.

Mulligan and Crowe[138] describe a procedure very similar to that advocated by Brown, Lillie, Salinger and others for the treatment of severe acute frontal sinusitis. The object is to provide adequate drainage in those cases in which palliative treatment fails to give the patient relief from pain and fever because of failure of the nasofrontal duct to remain patent. It consists of a small hairline incision in the eyebrow sufficient to expose the periosteum, which is incised and retracted just enough to permit the application of a small perforator or burr. [I prefer a small circular trephine, which removes a button of bone about 6 mm. in diameter. S. S.] Care is taken not to damage the tissues by undue handling. The sinus contents are gently aspirated, after which the cavity is irrigated with physiologic solution of sodium chloride and a small soft rubber drain or gutta-percha roll is inserted for twenty-four hours. The wound is kept open subsequently as long as necessary by gently touching the edges with phenol several times a week. The sinus is irrigated with physiologic solution of sodium chloride at each dressing. When patency of the duct is established, as manifested by the solution's coming through the nose, the external wound may be permitted to close. The authors used this treatment in 36 cases, in all of which there was recovery without complications except in 1, in which suppurative parotitis and staphylococcic septicemia with multiple abscesses developed. The patient eventually recovered. The authors claim that there is no danger of causing osteomyelitis. [This is particularly true if the trephine opening is made through the floor of the sinus, which is more compact than the anterior wall and contains fewer marrow spaces. S. S.]

Tatrallyay,[139] after pointing out the dangers of the Killian external and the Halle intranasal approach, states that in his experience the key to adequate treatment of a chronically infected frontal sinus is the removal of the anterior ethmoid cells through the agger nasi. He has done this operation 31 times with excellent results. He claims that in most cases chronic frontal sinusitis unless complicated will yield to proper widening of the passage into the nose with intelligent irrigation and ventilation. In no case is the posterior or internal aspect of the nasofrontal duct disturbed, which insures its patency, and if a proper mucous membrane flap is made to cover the denuded bone of the anterior wall of the duct the permanency of the passage is assured.

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138. Mulligan, E. J., and Crowe, S. J.: Treatment of Acute Infections of the Frontal Sinus, Ann. Otol., Rhin. & Laryng. **50**:499 (June) 1941.

139. Tatrallyay, Z.: Indikation und Gefahren der intranasalen Stirnhöhlenerőffnung, Monatschr. f. Ohrenh. **74**:626 (Dec.) 1940.

Hofer [140] cites 5 cases of radical operation on the frontal sinus in which despite most careful exenteration of the diseased tissue and strict attention to technical details, such as preservation of the processus frontalis and cleaning out of dependent pockets, healing failed to take place and persistent fistula necessitated reoperation. Bacteriologic examination in each case revealed virulent diphtheria bacteria. Treatment with antitoxin resulted in healing. The author expresses his great surprise at this unusual finding and comments on the importance of bacteriologic research in such cases. He also points out that whether one does the Riedel obliterating operation or the Killian operation it is necessary to clean out the ethmoid and sphenoid sinuses at the same time whether they are diseased or not in order to insure adequate communication between the operative field and the nasal cavity.

Stamm [141] describes the Halle operation, which he has found to be satisfactory in a series of 142 cases from 1925 to 1939. The ethmoid sinuses are partially or completely cleaned out if necessary and the antrum opened intranasally if indicated. In 72 per cent of the cases there was no secretion after four to twelve weeks. Twelve of the patients had continuous or intermittent discharge for several months to three years; because of the slight nature of the symptoms he calls these patients cured. He concludes that he cured 90 per cent of the entire group. The failure to cure in 10 per cent he attributes to the chronic nature of the disease with a marked degenerative process affecting the mucosa. Only 1 patient required emergency reoperation because of osteomyelitis. He cites the obvious advantages of the intranasal approach in the vast majority of uncomplicated cases.

Arauz [142] has had good results functionally and cosmetically from the Uffenorde technic with certain modifications, which are fully explained in the text. The frontal sinus is cleaned out through resection of the floor. The anterior wall is not disturbed. Most of the nasal bone and ascending process of the superior maxilla is removed after stripping off the internal mucoperiosteum, which is preserved for lining the future enlarged nasofrontal passage. This opening affords a clear view of the attachment of the middle turbinate, uncinate process and agger cells. He avoids removing the lamina papyracea and lacrimal bone, thus obviating any danger to the trochlearis or disturbing the orbital contents. Lastly he removes the nasal process of the frontal

140. Hofer, G.: Zur Frage der nicht heilenden Stirnhöhlenoperation, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **148**:272, 1940.

141. Stamm, C.: Intranasal Operation on the Frontal Sinus, Laryngoscope **51**:77 (Jan.) 1941.

142. Arauz, S. L.: Método de elección para el tratamiento radical de la sinusitis fronto-etmoidal crónica, utilizado en el Servicio de oto-rino-laringología del Hospital Rawson, Rev. brasil. de oto-rhino-laring. **8**:479 (Nov.-Dec.) 1940.

bone down to the level of the internal face of the sinus. Contrary to Uffenorde, the author recommends a single inferior flap in place of the small superior flap, which tends to curl and develop granulations that obstruct the lumen of the new passage. His flap serves to cover the external aspect of the passage while he relies on the mucosa of the septum to epithelize the internal aspect. He claims that his technic results in a direct broad passage from the frontoethmoid area into the middle meatus of the nose. He uses a rubber tube about 6 mm. in diameter for five to seven days. It extends into the new cavity down to the naris and serves to keep the middle turbinate out of the way until the passage is assured of its permanent patency.

Ethmoid Sinus.—Bisi [143] presents a résumé of the anatomy, development and physiology of the sinuses and a brief discussion of sinusitis in all its phases, including the infections of infancy and the influence of allergy. Discussing the treatment, he gives a great deal of space to a description of the transantral operation described by Ermiro de Lima, which, as noted heretofore in these reviews, seems to be very popular in the South American republics. Several drawings, photographs and roentgenograms from illustrative cases amplify the description. The chief point made by the author is that the operation accomplishes a complete exenteration of the pathologic changes in the antrum and the ethmoid and sphenoid sinuses and also effects a widening of the nasofrontal duct so as to facilitate ample drainage from the frontal sinus. Another important fact stressed is that the mucosa of the nasal cavity is preserved and the middle turbinate can be retained if it is not diseased. In fact, the turbinal which is left in place until the last serves as a guide to the cells and as a protection against injury to the cribriform plate as well as the nasal mucosa. He advocates blocking the second division of the trigeminal nerve at its emergence from the cranium by the Lindemann technic as modified by F. Tobias, in which the needle penetrates 42 to 55 mm. in the temporozygomatic fossa lateralis and in the anterior inferior angle formed by the external orbital wall and the horizontal ramus of the zygoma. Also, the posterior ethmoid and infraorbital nerves are blocked. In addition, he uses topical application of cocaine within the nasal cavity. When the antrum is opened, as in the typical Caldwell-Luc operation, the anterior wall is resected sufficiently to expose the superoposterointernal angle, which is the best location at which to enter the ethmoid cells. With forceps and curet the cells are removed with their contents, the turbinal being kept in place as a guide. The cells expand posteriorly at the expense of the orbit in the direction of the apex. The lamina papyracea and the roof of the ethmoid labyrinth offer smooth and fairly resistant plates of bone as guides against entering

143. Bisi, H.: Las infecciones de los senos paranasales y su tratamiento, Rev. med. y cien. afin. **2**:822 (Nov. 30) 1940.

the orbit or the cranial cavity. In an anterior direction the cells are cleaned out so that the nasofrontal duct is widened without the necessity of attacking the internal nasal spine, which is very resistant and often may be the starting point of an osteomyelitis if injured. He points out that this process is the reverse of the Mosher and Halle operations, which depend on removal of the spine for the approach to the frontal sinus. The sphenoid sinus is easily entered from the depth of the ethmoid exenteration by means of a curet and is widened with the Citelli forceps. The anterior wall can be resected widely without injuring the sphenopalatine artery. Drainage is established from the large cavity thus created posteriorly, and apparently no counteropening is made in the inferior meatus. The author adds that drains are unnecessary, and in some cases he even allows intranasal polypi to go until a later date, when they are easily removed intranasally.

An interesting discussion led by J. C. Hogg [144] on the subject of surgical therapy of the sinuses, particularly of the ethmoid sinuses, brought out some rather clearcut deductions on the part of a number of discussants. Hogg is very enthusiastic about the efficacy and ease of performance of the transantral ethmoidectomy, which he performs with the patient under general anesthesia. Half of his 106 patients that he was able to trace had been operated on bilaterally, and 60 per cent were completely healed and had no symptoms. In 26 per cent there were slight residual pathologic changes, such as a few small polyps or secretion coming from the remote superoexternal corner of the ethmoid labyrinth, which yielded readily to minor correction at the clinic or office. These patients all were cured. In a few the frontal sinus failed to clear up and had to be operated on later, and also in a few the sphenoid opening closed too rapidly and had to be reopened. On the whole, the author feels that this procedure has more to offer than any other method of attack, since it avoids an external scar and affords a clear view of the cells which are attacked from the safest angle, i. e. from below, and also because at the same time the antrum is cleaned out, something that is necessary in practically all cases of chronic ethmoiditis. Birdsall agrees with Hogg in all respects except in regard to the anesthetic. He has not found it necessary to give his patients a general anesthetic, being able to obtain good local anesthesia. Since the most sensitive area is about the ostium of the antrum, he infiltrates with procaine hydrochloride solution before doing the ethmoid part of the operation. As for crusting, he believes that this symptom is due not to the removal of too much tissue from the nose but rather to isolated foci of infection which continue to drain. Daggett prefers the external

144. Hogg, J. C., in discussion on Aspects of Sinusitis (Treatment of Chronic Ethmoiditis by the Transantral Operation), Proc. Roy. Soc. Med. **34**:117 (Jan.) 1941.

operation, because it affords a better approach to the frontal and the frontoethmoid cells as well as to the orbital cells, which are so difficult to reach through the antrum. Layton pointed out that if one is adept at making injections into the second division of the fifth nerve one will find an ideal area for anesthesia in the regions of the antrum and ethmoid and sphenoid sinuses. Russell's criticism of the transantral approach also hinged on the inaccessibility of the frontoethmoid group by this procedure and also on the fact that for most chronic conditions it is necessary to exenterate all the sinuses if a lasting cure is to be obtained. Hogg, in closing, stated that he does not favor trying to remove all the mucosa of the sphenoid sinus, especially if the sinus is deep and possesses an extension that was more or less inaccessible for good visibility. Also, with reference to the frontal sinus, he has found that in many cases the antroethmoid procedure brings about a cure. However, if necessary to open and clear out the frontoethmoid region, he has found it easy to do this through the nose after completing the transantral portion of the operation.

De Sa [145] gives a short history of the transantral approach to the other sinuses and compares the technic of Turnbull with that of De Lima, which he advocates. He makes a point of the fact that with the De Lima procedure the antrum and nasal cavity are not connected until the very end of the operation. The exenteration of the ethmoid sinuses from the sphenoid sinus forward into the frontal sinus is all done externally to the nasal mucosa. The author gives a brief description of the steps in the operation as described by De Lima. [This was reported by Mangabeira-Albernaz also and is included in the review for 1940.[146]] The author states that since the studies of Fiol, Terracol and Van Alyea, it has become more apparent than ever before that a monosinusitis is a rarity and that therefore to obtain a cure it is usually necessary to exenterate the entire labyrinth, including the antrum and the sphenoid and frontal sinuses. He believes that the De Lima technic offers the best approach anatomically to all the sinuses through one incision and the result is the formation of one smooth cavity of the ethmoid, frontal and sphenoid sinuses. His results have fully justified the procedure.

Horgan [147] adds a few interesting notes supplementary to his previous presentation by way of emphasizing his confidence in the transantral approach. He feels that the ethmoid labyrinth, especially its orbital extensions, and the sphenoid sinus can be most readily exenterated with

145. de Sa, A.: A via transmaxilar na cirurgia das polisinusites operacão de Ermiro Lima, Rev. brasil. de oto-rino-laring. **8**:457 (Nov.-Dec.) 1940.

146. Salinger, S.: Paranasal Sinuses, Arch. Otolaryng. **34**:603 (Sept.) 1941.

147. Horgan, J. B.: The Transantral Approach to the Ethmoidal and Sphenoidal Sinuses, J. Laryng. & Otol. **56**:290 (Aug.) 1941.

minimum damage to nasal and turbinal mucosa by the transantral approach, which enables one to convert these spaces into a floorless box into which the middle turbinate may be displaced so as closely to simulate normal conditions after healing has taken place. The physiology of the nose is thus preserved. He does not agree with Ferris Smith on the need of complete removal of all tissues ("totalitarian attitude" he calls it) and adds that he is not even convinced that this is possible. Since he is convinced that the antrum and ethmoid sinuses are concurrently involved, he can see no good reason for doing two separate operations, as advised by Ferris Smith, when the infected sinuses can all be dealt with through the one approach. The author submits a number of refinements in technic which may facilitate the procedure. He advises against packing the cavity and avoids postoperative irrigations unless the drainage becomes fetid or profuse.

Burritt [148] summarizes briefly his results in 114 intranasal ethmosphenoid operations. Twenty-nine patients had polyps, which recurred in 18. There were 25 cases of asthma with only 9 recurrences. All of the recurrences were in cases in which polyps developed. There were 7 cases in which retrobulbar neuritis, of short duration, cleared up promptly after operation. All of the patients were operated on under local anesthesia in the office, and there were only 7 with postoperative hemorrhage of any considerable extent.

Nishihata [149] believes that it is necessary to clean out the ethmoid as well as other infected sinuses at the same time that a radical operation of the antrum is done, because it is his experience that the antrum is seldom affected alone. Also, in Japanese, whose nasal ostiums are narrow, it is extremely difficult to reach all the ethmoid sinuses through the intranasal approach, but the problem is simplified by attacking them through the opened antrum.

Tanaka [150] takes issue with Nishihata on the question of simultaneous operations on the ethmoid sinuses and the antrum. He does not explain exactly under which conditions such a procedure is advisable but states that as a rule he is not in favor of it.

Maxillary Sinus.—Kolba [151] reports on 285 operations performed on 256 patients in the Red Cross Hospital of Budapest during the past fourteen years. He prefers the Caldwell-Luc operation because of better

148. Burritt, W. W.: One Hundred and Fourteen Intranasal Ethmo-Sphenoid Operations, J. M. Soc. New Jersey **38**:409 (Aug.) 1941.

149. Nishihata, T.: Zur operativen Behandlung der Nasennebenhöhlenentzündung, Oto-rhino-laryng. **14**:7 (Jan.) 1941.

150. Tanaka, F.: Zur Behandlung der chronischer Nasennebenhöhlenentzündungen (Gegen die Ansicht von Prof. Dr. T. Nishihata), Oto-rhino-laryng. (Abstr. Sect.) **14**:19, 1941.

151. Kolba, W.: Indications of Radical Antrum Surgery, Orvosi hetil. **48**:611 (Nov. 30) 1940.

cosmetic results than with any other procedure. The following data are given: The Caldwell-Luc operation was done in 268 cases: in 25 cases it was done on the two sides at the same time and in 5 it was done on the second side later. Denker's operation was done in 17 cases and in 1 case was done on the two sides. According to the age of the patients, 7 operations were done in the 6 to 10 year group, 24 in the 10 to 20 group, 182 in the 20 to 50 group, 27 in the 50 to 60 group, 17 in the 60 to 70 group and 3 in the group over 70. Complications after operation, such as cellulitis of the face (in 1 case, that of a woman with chronic nephritis whose several teeth and radices were removed synchronously), otitis following tamponade (1 case), bleeding (4 cases) and fistula (3 cases), are reported. Disturbance of sensation of the upper anterior teeth, mainly hypesthesia, subsided in a few weeks. At the same sitting, they also performed resection of the nasal septum in 18 cases, ethmoidectomy in 18 and both in 8; removal of the agger nasi in 3 cases, removal of the middle turbinate in 3 cases, sphenoethmoidectomy in 2 cases, Killian's frontal operation in 3 cases and conchotomy on the opposite side in 5 cases. The conclusions were that radical operation on the antrum should be performed: (1) if the process does not improve after conservative treatment and is to be considered as chronic; (2) in case of chronic remittent inflammation if irrigations prove ineffective; (3) in similar cases even if conservative treatment tends to stop secretion of the antrum, if patients are unable to spend sufficient time at a place where a specialist is available (social indication!), and (4) in case the antrum is filled with polypoid masses.

Nail [152] advises a study of the general condition of the patient before one embarks on a radical operation. This should include an examination of the teeth and investigation of the possibility of syphilis being present. When allergy is known to be a factor it should not constitute a contraindication if the pathologic changes in the sinus warrant radical surgical therapy. His results show 58 patients cured, 7 improved and 1 not benefited. Of 9 listed as having the silent type, 6 had symptomatic relief from the condition that prompted the operation, this justifying the procedure. Of 9 cases of asthma and coexistent allergy, relief was obtained in 5 to a greater or less degree. The author recommends that the mucosa around the ostium be left alone as far as possible, and that only the mucosa that is palpably diseased or under suspicion be removed.

Crawford [153] believes that it is more difficult to do a thorough intranasal antrotomy than a Caldwell-Luc operation and feels that controversies between the proponents of the two methods may often be due to

152. Nail, J. B.: Chronic Maxillary Sinusitis: Report of Seventy Cases in Which Resort Was Made to the Caldwell-Luc Operation, Arch. Otolaryng. **34**:99 (July) 1941.

153. Crawford, H. E.: An Evaluation of the Surgical Treatment of Chronic Sinusitis, Dis. Eye, Ear, Nose & Throat **1**:106 (April) 1941.

poor results, which are not the fault of the operation itself but rather of inadequate technic. He personally prefers the Caldwell-Luc operation, and in a series of 70 cases followed for some time after operation there was only 1 recurrence, in a case of severe ethmoid disease. As for chronic disease of the ethmoid sinuses, he has had excellent results from the intranasal operation and cites a personal experience with 61 cases. He does not believe that most surgeons are sufficiently experienced with the external approach to insure uniformly good results but adds that in a group of 14 cases of his own the results were good except in 2 in which recurrence was due to closure of the nasofrontal duct. On the whole, he feels that if the patient has been given the benefit of adequate and close attention over a reasonable length of time with local and general treatment and the sinus infection still persists, it is better to do a more thorough operation than to rely on procedures that fall short of eradicating the involved tissue.

Reports of postoperative cysts of the cheek after Caldwell-Luc operations continue to appear in the Japanese literature, 2 more being reported by Ienaga.[154] In 1 case the swelling appeared seven years after the operation. When exposed and removed it was found to contain a brownish fluid and crystals of cholesterol. In the second case the cystic cavity not only occupied the entire antrum but extended into the ethmoid cells. In both cases, the author remarks, the original operation was attended by considerable hemorrhage.

Iwata [155] reports 2 cases of serious complications following Caldwell-Luc operations in young women. In the first case the orbital wall of the sinus was found to be roughened and the sinus filled with foul pus. Sepsis and endocarditis developed, which gradually subsided within three weeks. In the second case the orbital wall of the antrum was eroded and pain in the eye and diplopia developed, probably the result of a low grade cellulitis. In this case also the patient recovered.

Lore [156] covers a wide field pertaining to maxillary sinusitis with some personal observations and clinical reports. In doing an antrotomy he uses a Faulkner bob to enter the sinus and breaks down the inferior and anterior margins with a rasp. He depends on subsequent bougienage to maintain the opening.

Sphenoid Sinus.—Beck [157] has done a few operations on the pituitary by the external transethmosphenoid approach, first described by Chiari,

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154. Ienaga, J.: Zwei Fälle von postoperativer Wangenzyste, Oto-rhino-laryng. (Abstr. Sect.) **14**:10, 1941.

155. Iwata, I.: Abnormer Verlauf nach der Radikaloperation der Kieferhöhle, Oto-rhino-laryng. (Abstr. Sect.) **13**:27 (June) 1940.

156. Lore, J. M.: Maxillary Sinusitis and Its Relationship to the Oral Cavity, Dis. Eye, Ear, Nose & Throat **1**:241 (Aug.) 1941.

157. Beck, K.: Zur Technik der extranasalen transsphenoidalen Hypophysenoperation, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **148**:240, 1940.

and claims that for intrasellar growths it is very successful. He points out that in order to be sure that one does not enter the anterior fossa in taking down the posterior wall of the sphenoid sinus, it is wise at the time this sinus is opened and the septum removed to place a heavy probe or small curet against the area which seems to be just below the pituitary and have a lateral roentgenogram taken for orientation. By this means it is possible to outline exactly the precise spot where it is safe to begin to remove bone. Two illustrations accompanying the article demonstrate this point. The author also states that he uses radium after the operation even if the growth is a cyst in order to prevent a recurrence from the epithelial structures forming the base.

Dixon [158] calls attention to the variable size of the sphenoid sinus and the presence of septums, dehiscences and pockets, all of which make diagnosis and treatment difficult. He finds it possible to catheterize the ostium in 75 per cent of all cases and describes his procedure. He uses a small thin flexible catheter measuring 7 cm. from tip to shoulder. It is bent with an arch 5 to 10 mm. in height. It is used for probing the slope of the anterior wall and the sphenoethmoid recess. In some cases the sinus is punctured rather than probed through the ostium, and this is possible when the anterior wall is thin. Puncture, however, should not be done unless the area is previously outlined by roentgen studies.

NONSURGICAL THERAPY

General Considerations.—Moore's treatment [159] of acute and subacute sinus infection follows the accepted routine of the day with respect to the use of isotonic solutions of ephedrine, heat, rest and general measures for sustaining resistance. In addition, he is definitely in favor of the use of a larger tampon than Dowling advocates, and to the silver protein preparation he adds ephedrine and larocaine. He states that in several thousand cases in which this treatment was used he has never encountered an instance of argyria. Also, he feels that there is merit in the use of stock vaccines. He finds that irrigation is more effective and more readily practiced on the antrum than displacement and has observed that in the vast majority of cases he was able to irrigate through the middle meatus with less trauma and pain than via puncture through the inferior meatus.

Haslinger [160] indulges in some very elementary observations for the benefit of the general practitioner on such matters as eczema of the

158. Dixon, F. W.: Practical Points in the Treatment of Sphenoiditis, Arch. Otolaryng. **34**:117 (July) 1941.

159. Moore, J. H.: A Résumé of Conservative Sinus Management, South. M. J. **34**:848 (Aug.) 1941.

160. Haslinger, F.: Die Behandlung der Nasen- und Nebenhöhlenerkrankungen durch den praktischen Arzt, Wien. klin. Wchnschr. **54**:285 (April 5) 1941.

vestibule, furunculosis, epistaxis, acute rhinitis and acute sinusitis. On the latter topic he points out that pain or headache due to sinus infection is always in the same location and recurs at regular intervals, thus distinguishing it from headaches of nonsinus origin. He recommends, in addition to the use of agents that shrink the nasal mucosa, the employment of local heat in the form of hot applications and radiant heat.

Chemotherapy.—Turnbull [161] reports on the use of sodium sulfathiazole (the sodium salt of 2-[paraaminobenzenesulfonamido]-thiazole) in the nose for the treatment of chronic sinusitis. This report was unfortunately written up in the lay press and caused quite a bit of excitement among the host of sufferers from this condition, many of whom bombarded their rhinologist or family physician for the "new cure." The author used a 5 per cent solution as a spray in 47 patients with chronic sinusitis, all but 7 of whom reported relief from symptoms. Of the 40 reporting improvement, 20 showed an increase in nasal drainage with relief of symptoms and opening up of the nose. The symptoms mentioned were heaviness, fulness and pressure over the maxillary or frontal sinuses. When the drug was instilled into the sinuses directly the author was unable to draw any definite conclusions as to its efficacy. There was no diminution in discharge or other symptoms. Apparently the relief that followed the use of the drug as a spray was due to the increased flow of nasal secretion with subsequent clearing of the head. The author found no deleterious reactions. He suggests that the fact that sulfathiazole is known to be effective against staphylococci, which are the most prevalent germs found in cases of chronic sinusitis, may account for the relief that patients reported. One must conclude that the treatment would have to be followed up and the patients seen for a long time before one might attempt to draw any conclusions as to the value of the treatment.

Fletcher,[162] commenting on the publicity following the publication of an article on the use of a solution of sulfathiazole in the treatment of sinusitis, reports a case in which the deleterious action of the drug was manifested. A 5 per cent and later a 10 per cent solution was employed about ten times within three weeks in irrigating a sloughing necrotic alveolar socket after the removal of a molar. After the sequestrum and the two adjacent teeth were removed, with a large opening left into the antrum, it was observed that there was a large amount of black claylike material filling the cavity, which was removed by irrigation and scooping. The author contends that inasmuch as the sodium salts of sulfanilamide

161. Turnbull, F. M.: Intranasal Therapy with Sodium Salt of Sulfathiazole in Chronic Sinusitis, J. A. M. A. **116**:1899 (April 26) 1941.

162. Fletcher, R.: Sodium Sulfathiazole: Its Caustic Action, California & West. Med. **55**:94 (Aug.) 1941.

derivatives are extremely alkaline, having a p_H of 10 to 11, they are extremely caustic and in this case the solutions charred or burned the granulations and mucosa with which they came in contact.

Bowers [163] finds that the antrum is the seat of most of the nasal troubles in the average office practice. He noted that in 86 per cent of 335 cases of sinus infection observed in private practice there was some involvement of the antrum, either alone or in combination with other sinuses. In discussing chemotherapy he states that the use of sulfanilamide and its derivatives in the sinuses is still in the experimental stage and warns against overenthusiasm. If in a case of severe involvement it seems advisable to employ one of these compounds, he recommends that frequent roentgenograms and blood counts be made in order to avoid the error of overlooking advancing pathologic changes due to masking and also that frequent blood counts be made for the detection of early signs of toxic effects.

Vaccines and Vitamins.—Townsend [164] reports the results of treating 193 patients with acute and chronic recurring infections of the upper respiratory tract with intradermal injections of staphylococcus toxoid. An initial test injection of 0.03 cc. of dilute toxoid (100 units per cubic centimeter) was given, which in susceptible persons elicited a cutaneous reaction (twenty-four hours) of 5 cm. or less. Weekly injections were then given totaling 660 units in adults and 991 units in children, which is about one-tenth the usual amount employed. Sixty-five of the subjects showed favorable responses and 35 per cent doubtful or negative. Of the cultures of material taken from the nose, 66 per cent yielded pure staphylococci. In group 1, patients with frequent afebrile colds and chronic low grade illness, Staphylococcus albus being the predominant offender, those patients who gave negative cutaneous reactions had favorable results when treated with full doses of the toxoid. In group 2, patients with infrequent febrile colds and more acute illnesses (streptococci and Staphylococcus aureus predominating), those who showed positive cutaneous reactions from the toxoid had unfavorable results from treatment, although fractional doses often gave relief. In cases of recurring attacks of purulent rhinitis with predominating staphylococci, good results were obtained from the injections. The rules laid down by the author are: 1. Take material for culture only in the presence of an active process. 2. Determine the type of staphylococcus present. 3. Determine the sensitivity of the skin before undertaking treatment.

163. Bowers, A. C.: Infections of the Middle Ear and Nasal Sinuses, Bull. New York Acad. Med. **17**:453 (June) 1941.

164. Townsend, K. E.: A Skin Reaction Controlled Low Dosage Method of Treatment with Staphylococcus Toxoid: Its Use in a Certain Type of Acute Recurrent Rhinitis, Ann. Otol., Rhin. & Laryng. **50**:1189 (Dec.) 1941.

4. Treat only persons showing negative cutaneous reactions after twenty-four hours. 5. Do not treat Staph. aureus infections with full doses of the toxoid. 6. Search for the primary infection when Staph. aureus is found. 7. Treat only primary staphylococcic infections, remembering that the staphylococcus is a frequent secondary invader.

Walsh [165] reports further progress in his studies of the action of vaccines employed as a nasal spray for the prevention of colds.[166] A résumé of 627 patient years of vaccination yielded 74 per cent good results, 10 per cent fair results and 16 per cent failures. Compared with those in a control group receiving a placebo mixture, the results were definitely in favor of the vaccine-treated group. Since these studies have been carefully carried out over several years under careful medical supervision, the author feels that the results are sufficiently encouraging to warrant continuing the investigation.

Spiesman [167] studied a group of 54 patients under treatment with vitamins for the prevention of colds for three years and found that whereas vitamins A and D administered separately failed to result in any diminution of the incidence of colds, when given together they yielded beneficial results in 80 per cent of the subjects. This was manifested by a reduction in the number and severity of attacks over a given period. The author does not claim the treatment is a panacea for colds, because of the varying susceptibility of the subjects as well as the emotional state, as affected by the vasomotor mechanism. The vitamins were given in large doses from September 1 to June 1. The dose of vitamin A (fish oil concentrate) was started at 9,000 U. S. P. units per day and increased every few days up to a maximum of 40,000 units; the dose of vitamin D (solution of calciferol in oil) was started at 120,000 U. S. P. units daily and increased up to a maximum of 300,000 units.

Drugs.—Moura [168] reports in brief 15 cases of sinusitis (mostly of the antrum and frontal sinus) in which the instillation of an iodoform in glycerin solution at times alternated with a solution of a sulfonamide compound, effected brilliant recoveries. [The sulfonamide compound use is designated by Moura as "rubiazol." Since this name has been applied to several different compounds, we are not certain which one is meant. Editor.] The best results were obtained in cases of subacute or

165. Walsh, T. E.: Prophylaxis of the Common Cold, Arch. Otolaryng. **34**: 1093 (Dec.) 1941.

166. Previous article: Walsh, T. E.: Intranasal Vaccine Spray: Its Use in Prophylaxis Against the Common Cold, Ann. Otol., Rhin. & Laryng. **49**:875 (Dec.) 1940.

167. Spiesman, I. G.: Massive Doses of Vitamins A and D in the Prevention of the Common Cold, Arch. Otolaryng. **34**:787 (Oct.) 1941.

168. Moura, A.: Das sinusitis, Rev. brasil. de oto-rino-laring. **8**:659 (Nov.-Dec.) 1940.

chronic conditions, with purulent fetid discharge, in most of them after only one to three treatments. In 1 case ten treatments were given. The author noted that when the instillation of the rubiazol was followed promptly by the appearance of the solution in the urine the sinus condition cleared up and vice versa. The author also records several instances in which the use of a contrast medium confirmed the diagnosis of polyposis of the antrum, which was confirmed by operation, and he recommends this procedure in all cases in which there is any doubt.

Claus,[169] in a series of 531 cases of antrum suppuration in which operations were performed in the course of six years, found the condition in 67.8 per cent due to nasal causes and in 32.2 per cent of dental origin. After irrigation he injects 0.5 to 1 cm. of 10 per cent iodoform in glycerin into the sinus with the head tilted back. If the fluid tends to come back through the needle, it is an indication that the lining mucosa is hypertrophied. He considers this a worth while finding but states that the iodoform-glycerin mixture resulted in a number of cures. Also he finds it valuable as a contrast medium for roentgen studies and has never seen any ill effects from the iodine.

Hünermann,[170] speaking from experience with troops in the field, among whom antrum infections seem to be common, has found the instillation of cod liver oil directly into the antrum of distinct benefit, and since using it extensively he has done away with routine irrigations and limited the number of operations required. He points out that in all cases the possibility of dental foci should be eliminated, since these have been found to exist frequently and act as the etiologic factor making for chronicity. He attributes the favorable action of the oil to the synergistic action of the vitamin A and the free fatty acids. Also the fact that the oil remains in the sinus for a long time tends to prolong the action. In some cases of ethmoid and sphenoid disease he employed the oil by displacement, according to Proetz, but claims that the results were not as classic as in the antrum infections.

Goodyear [171] is impressed with the value of iodized oil instilled into the antrum at weekly intervals in certain types of chronic infection of the antrum. He uses a 27 per cent iodized and 7.5 per cent chlorinated peanut oil in the amount of 2 cc. for each antrum. If this is used after irrigation the roentgenograms show that the oil sinks to the bottom, displacing the water. He employs the oil also after very acute symptoms

169. Claus, G.: Zur Diagnostik und Therapie der Kieferhöhlentzündung, Monatschr. f. Ohrenh. **74**:287, 1940.

170. Hünermann, T.: Ueber die konservative Behandlung der Nasennebenhöhlenentzündungen, insbesondere die Lebertranfülling der Kieferhöhle, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **148**:264, 1940.

171. Goodyear, H. M.: Use of Iodized Oil in the Treatment of Infections of the Nasal Antrum, Arch. Otolaryng. **34**:1133 (Dec.) 1941.

have subsided and has found that even in the presence of pus it may not be necessary to irrigate before using the oil. He reports beneficial influence on coexistent ethmoiditis and bronchial cough.

Roost [172] has found the use of ichthammol-glycerin tampons (10 per cent) efficacious in acute sinusitis because of the soothing effect of the ichthammol and the hygroscopic effect of the glycerin. Also, he has found the use of ephedrine unsatisfactory because of its fleeting effect and frequent subsequent congestion. He emphasizes the importance of drainage when the symptoms are urgent, even if it necessitates the making of an opening in the affected sinus (the tampons are used every day for the acute conditions, followed by a short wave diathermy treatment).

Umanskiy [173] performed a number of experiments with a rather complicated apparatus for the purpose of determining the density of various medicaments commonly used in vapor or spray form in the nose. He was able to record not only the concentration within a given volume of the vapor but also the size of the particles. He found that in the space of one minute oily vapors produced 21 liters, whereas watery vapors developed only 15 liters. The density of the oily vapor was 12 mg. per liter and of the watery vapor 63 mg. per liter. The apparatus was able to break up 0.5 to 1 per cent of the oil within five minutes and 4.5 to 5 per cent of watery solution in the same period.

Roentgen Ray and Short Wave Therapy.—Kornblum [174] presents a review of the leading articles on roentgen therapy of sinusitis of the past few years and states that his experience extending over a period of ten years and embracing about 400 cases agrees in the main with the results of the authors cited. He admits that accurate evaluation and interpretation of results are difficult because of numerous variable factors that apply to the diagnosis of sinus disease, such as its variability, its tendency toward spontaneous remissions, changes in the patient's status at different times and allergy. However, since the results published by numerous investigators over some time seem to agree, it is safe to assume that the therapy possesses definite merit if properly applied. Analyzing his results, the author finds that a small dose (starting with 50 r) is beneficial in acute sinus disease. Subacute conditions are markedly benefited by doses of from 100 to 200 r because of the prompt action of the rays in promoting absorption of the spongy tissue due to the presence of large numbers of leukocytes. Chronic conditions with exacerbations repre-

172. Roost, F. H.: The Care of the Acute Sinus, Journal-Lancet **61**:49 (Feb.) 1941.

173. Umanskiy, Y. P.: Amount and Physical State of Sprayed Particles During Inhalations of Drugs Using Various Types of Apparatus, Zhur. ush. nos. i gorl. bolez. **16**:434, 1939.

174. Kornblum, K.: The Present Status of Roentgen Therapy in Sinusitis, Ann. Otol., Rhin. & Laryng. **50**:523 (June) 1941.

senting hyperplasia and recurring colds during changes of weather may be helped by administration of full doses of roentgen rays in series which may be repeated once or twice a year. Patients with extensive fibrosis or polypi will not respond to roentgen therapy. However, patients who have been subjected to numerous operations on the sinuses without complete relief frequently are benefited by roentgen therapy. The author is enthusiastic about the treatment of chronic sinus disease in children, particularly when it is associated with symptoms in the lower part of the respiratory tract. The results are good because the pathologic process seldom advances to the stage of fibrosis and usually the spongy membranes along with the lymphatic masses commonly found in association yield readily to irradiation. The author prefers high voltages (200 kilovolts) except in children. As a rule he uses a 200 kilovolt peak, 30 milliamperes, 0.5 mm. of copper and 1 mm. of aluminum at 50 cm. Three portals are used, a frontal and two lateral. Treatments are given three times a week using one portal at a time. Eight treatment are given altogether, with 400 r total to the frontal and 200 r each to the lateral portals.

Youngs [175] reports on the results of roentgen therapy in a series of 75 patients with chronic sinusitis ranging in age from 4 to 66 years. The percentage of cures was highest in the group from 4 to 17 years of age and lowest in the group from 41 to 66 (60 per cent in the former and 17 per cent in the latter). Since no attempt was made to eliminate those with allergy, it is difficult to draw any conclusions except that in the author's opinion even the patients with allergy seemed to be benefited. Another factor that must be taken into consideration in evaluating this report is the fact that very few of the patients were followed as long as a year, most of them being reported on a few months after treatment. The author found no ill effects from the treatment.

Rich [176] reports 2 cases of successful use of roentgen rays in the treatment of chronic sinusitis. In 1 case a man of 40 had undergone two operations (Caldwell-Luc) some time previously and was still suffering from pains in the teeth and jaw. Roentgen examination showed the antrum that had been operated on to be very dark, and irrigation revealed a clear straw-colored fluid but no pus. The author believes that the pictures showed polypi and possible cyst formation. Treatment consisted of irrigations and roentgen therapy. When he was examined three months later his antrum was practically clear, and he was symptom free. The second patient was a child of 7 years with frequent colds and sore throats and nasal discharge. Roentgen examination revealed cloudy

175. Youngs, N. A.: Roentgen Therapy for Patients with Chronic Sinusitis, Arch. Otolaryng. **33**:550 (April) 1941.

176. Rich, B. S.: Roentgen Ray and Conservative Therapy in Chronic Sinusitis, Bull. School Med. Univ. Maryland **25**:181 (Jan.) 1941.

antrums and ethmoid sinuses with polyp formation. When he was examined one month after roentgen therapy he was symptom free and the sinuses showed excellent clearing.

Levin [177] summarizes the evidence in favor of radiation therapy for sinusitis but points out the necessity of having a rhinologic consultation before embarking on a course of treatment. He feels that the consensus favors repeated small doses over a period of time rather than a single large dose.

Piano and Niseggi [178] present a technical account of the action of diathermy with comments on the types of rays employed. They make it clear that success with this medium can be expected only in cases of acute and subacute conditions and that it is of little value in the treatment of chronic conditions. Its value lies in the decongestive action of the deep heat with relief from pain and more rapid absorption of the products of inflammation. Also, the authors emphasize the importance of preliminary shrinkage of the nasal mucosa before the treatment.

On the basis of 160 patients treated with short wave roentgen therapy, Brighton, Snow and Friedman [179] came to the conclusion that this form of therapy is without value in the treatment of allergic rhinitis. In cases of acute sinusitis they found that when this treatment was employed in conjunction with nasal shrinkage and irrigations the results were no better than when simple conservative measures were used alone. It is definitely contraindicated in the presence of acute sinusitis with local tenderness. In cases of chronic nonsuppurative disease and in cases in which the original symptoms persisted postoperatively, short wave therapy yielded good results in a majority of instances, particularly for the relief of headaches. The technic employed by the authors was with an apparatus accepted by the American Medical Association and a wavelength of 12 meters "with sufficient output to permit the use of arms with spacing." A 7 inch (18 cm.) disk was used in contact with the face and the other electrode at a distance of 11 inches (28 cm.) over the sternum with air spacing only. Fifteen minute treatments were given three times weekly for six weeks.

Eiras [180] writes very enthusiastically of the virtues of ultrashort wave therapy for all types of sinus disease, both acute and chronic. He believes

177. Levin, A. G.: Present Status of Radiation Therapy in Nasal Sinusitis, Arch. Phys. Therapy **22**:217 (April) 1941.

178. Piano, J., and Niseggi, C. H.: La diatermia por onda corta en los procesos inflamatorios de los senos paranasales, Rev. Asoc. méd. argent. **54**: 868 (Sept. 15-30) 1940.

179. Brighton, G. R.; Snow, V. B., and Friedman, H. S.: Short Wave Therapy in the Treatment of Sinusitis and Allergic Rhinitis, J. A. M. A. **118**: 507 (Feb. 14) 1941.

180. Eiras, F.: As sinusitis sao curaveis pela fisioterapia, Rev. brasil. de oto-rino-laring. **8**:441 (Nov.-Dec.) 1940.

that one must use a machine of high potential (1,000 watts) with a blue filter and that the treatment must be persisted in if good results are to be had. He claims that the beneficial action is the result of a decongestion of the tissues, analgesia of the inflamed nerves, bactericidal action on the deeply situated colonies of germs and sedative action on the general economy. He cites a number of cases in which cure was obtained, in some of which the condition had failed to yield to surgical therapy. In a number of the cases cited the sinus disease was acute, and he emphasizes the fact that prompt relief of the severe pain was obtained in a short time by means of his therapy. The author admits the necessity of surgical therapy in some cases but claims that restoration of the membranes to normal can be facilitated by the use of short wave. The reports of 30 cases accompany the article.

Prietzel [181] also is very enthusiastic over the virtues of short wave therapy of acute sinusitis. In a series of 63 patients so treated he claims that the disease was cured in a much shorter time than in a similar series treated by the conventional methods. He feels that not only do the patients get well in a shorter time but they feel better during the treatment. Also, he is convinced that the efficacy of the treatment is due not only to the virtue of the heat induced but also to the specific properties affecting the inflamed membranes no doubt possessed by the current. While no proof of such specificity is presented he cites a number of authors who have claimed that the current causes such actions as a lowering of the p_H, a reduction of the titer of autotoxin serum, stimulation of phagocytosis and stimulation of the precipitation reaction of the blood, all of which is speculative.

Hollender [182] makes it clear that short wave diathermy possesses no specific biologic action on inflamed sinuses and must be considered purely and simply as an effective agent in the production of heat within the tissues. Its chief function, therefore, is palliative in acute forms of sinus disease and then only provided adequate drainage is provided at the same time. He finds that the choice of electrodes makes little difference, since the action of the current is mainly dependent on the proper application of whichever electrode is employed. It has no influence on chronic sinusitis and is contraindicated in the presence of allergy and hypertropic conditions.

Miscellaneous.—Because certain patients with sinus disease had commented on relief obtained after rides in airplanes, Andrews, Roth and

181. Prietzel, F.: Kurzwellenbehandlung der akuten Nasennebenhöhleneiterungen, Monatschr. f. Ohrenh. **74**:496 (Oct.) 1940.

182. Hollender, A. R.: Present Status of Short Wave Diathermy in Nasal Sinusitis, Arch. Phys. Therapy **22**:12 (Jan.) 1941.

Ivy [183] experimented with treating patients in a chamber from which the air could be exhausted so as to simulate the atmospheric conditions at various heights. They adopted the average height of 8,000 feet (2,440 meters) because above 10,000 feet (3,050 meters) the patient would require oxygen. The rate of ascent was 1,000 feet (305 meters) per minute and the rate of descent 500 feet (152 meters) per minute. The descent was at a slower rate in order to avoid aero-otitis-media due to closure of the eustachian tube. Sixteen patients were so treated; 9 reported temporary relief from the acute symptoms, 5 were partially relieved and only 2 obtained no relief. No permanent conclusions could be drawn because of the small number of cases observed and because of the notorious tendency of sinusitis toward remissions and recurrences. The relief obtained is attributed to easier breathing because of the reduced density of the air and also probably to some vasoconstriction in the vascular supply of the mucosa.

A new instrument is presented by Wolf,[184] which is a modification of one previously described by him and is based on the old time Lichtwitz needle with the addition of a removable trocar, which is sharp pointed to facilitate introduction, and a cannula, which remains in place for the irrigation and is constructed to fit a Luer-Lok syringe. The author states that irrigation of the antrum through the natural ostium or the middle meatus is not always possible and that one should be prepared to puncture and irrigate in the least objectionable manner. His experience with this new instrument has been very satisfactory, and many patients prefer it to cannulization through the middle meatus.

CLINICAL OBSERVATIONS

General Considerations.—Nash [185] presents a very interesting analysis of the factors that tend to cause hypofunction and hyperfunction of the nasal mucosa and lists the various clinical states that may result. Among the conditions mentioned are "psychic rhinitis" and "food rhinitis." Illustrating the former he cites a patient in whom a bad cold developed two days before she was to appear in court as a witness, the condition subsiding one hour after the session. Another woman suffered colds only during attacks of anxiety neurosis, and a third had marked salivation and rhinorrhea during fits of anger. As an instance of food rhinitis he cites the case of a child who was relieved of a long-standing

183. Andrews, A. H.; Roth, L. W., and Ivy, A. C.: On the Use of Reduced Atmospheric Pressure in the Treatment of Paranasal Sinusitis, Quart. Bull. Northwestern Univ. M. School **15**:46, 1941.

184. Wolf, G. D.: An Improved Antrum Trocar, Arch. Otolaryng. **33**:1038 (June) 1941.

185. Nash, C. S.: A Broader Concept of Functional Diseases of the Nose, Ann. Otol., Rhin. & Laryng. **50**:458 (June) 1941.

nasal discharge by the elimination of candy from her diet. Under the heading of "endocrine rhinitis" he mentions the case of a girl of 15 who suffered from colds at each menstrual period and was relieved by the administration of an estrogenic substance and that of a woman who was cured of recurring colds and certain pelvic symptoms by the removal of a tumor in the pelvis. These data are very instructive, since they point out the great value of a careful history and a thorough search for constitutional factors, which are frequently lost sight of by those who concentrate too much on the local findings.

Maxwell [186] presents data on 13 cases of acute fulminating sinusitis due to swimming, with an analysis of the factors bearing on pathogenesis and therapy. It would appear to the author that the cause of this dreadful affliction is the "introduction of virulent organisms into a normal sinus which is completely unprotected and has not had the advantage of preforming any local barriers to the infectious process." His records show that fulminating sinusitis did not appear in patients with a history of chronic sinusitis. He believes this to be a significant observation because when an infection has already been present there must necessarily be a local reaction in the form of leukocytic infiltration and thickening of the mucosa which acts as a barrier against the rapid advance of pathogenic bacteria. The normal thin lining of the sinuses certainly offers no resistance to the spread of a virulent organism. Such an infection may cause an early septic thrombophlebitis of the veins in the thin substrata which spreads rapidly through communicating veins into the calvarium. This condition accounts for the early appearance of intracranial complications frequently before the development of pus within the sinus. The author believes that this constitutes a potent argument against early surgical intervention except as directed against the complication. In other words, an attempt to merely drain the sinus in the presence of complications is futile and may serve only to stir up the already virulent condition. Since the condition in many of the cases is staphylococcic in origin, he advocates the use of sulfathiazole at the very onset and in large doses.

Bowers [187] reviews the anatomy and physiology of the nasal sinuses and discusses the factors that predispose to infection. As has been noted by many writers in the past, this author also finds that the antrums are by far the most frequently affected of all the sinuses. In a series of 1,000 cases he was able to show that in 96 per cent the antrum was involved either alone or in conjunction with the others. This observation makes it imperative that the antrums be adequately treated and

186. Maxwell, J. H.: Some Experiences with Sinusitis in Swimmers, Arch. Otolaryng. **34**:797 (Oct.) 1941.

187. Bowers, W. C.: Infections of the Middle Ear and Nasal Sinusitis, Bull. New York Acad. Med. **17**:453 (June) 1941.

cured if one is to avoid recurrences and involvement of the other sinuses. He is opposed to the prolonged use of protein silver solutions because of the danger of argyria, which he has observed on several occasions. His experience with sulfanilamide and its derivatives has been striking in severe infections with impending complications, but he does not recommend relying on them in the presence of an undrained focus.

Among the questions posed by Johnson [188] are: "What can the otolaryngologist tell of his patient's intelligence quotient by roentgenograms of the sinuses and mastoid?" and "Do the characteristics of the skull observed in cases of hyperpituitarism predispose to the complication of osteomyelitis in cases of frontal sinusitis?" He describes four types of skulls based on pituitary levels: (1) expansion of the trabecular structure with thinning of the tables, as found in overactivity of the anterior lobe; (2) absence of diploic structure and minimal pneumatization in cases of anterior lobe deficiency; (3) expansion of the diploic structure and hyperpneumatization in overactivity of the anterior lobe, with secondary sclerosis of the inner table as the function of the anterior lobe fails (the changes are most pronounced in the frontal bone); (4) absence of diploic structure with both tables in close approximation and poor pneumatization, as seen in patients with congenital or preadolescent deficiency of the anterior lobe, the type recognized as the "pituitary dwarf." Examination of several cases leads the author to the conclusion that overactivity of the anterior lobe is associated with a high intelligence quotient and, contrariwise, that patients with a low mentality have shown a remarkable lack of pneumatization of the mastoids and sinuses. He also concludes that skulls of types 1 and 3, being well developed in diploe and consequently more vascular than the other types, must be more susceptible to osteomyelitis as a complication in the presence of adjacent infection.

Payne [189] emphasizes the importance of adequate diagnosis as to the type of sinusitis or predominating etiologic factor. He classified the disease as being of three types, namely, the allergic, the endocrine and the suppurative or inflammatory. As to treatment, he finds it convenient to consider the disease under the following five heads: allergic (serums and iontophoresis), endocrine (glandular extracts), syphilitic (antisyphilitic treatment), of dental origin (surgical therapy and chemotherapy) and suppurative (surgical or roentgen therapy or chemotherapy).

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188. Johnson, L. F.: Possible Deductions of Endocrine Significance from Roentgenograms of the Sinuses and Mastoid, Arch. Otolaryng. **33**:725 (May) 1941.

189. Payne, V. L.: Sinus Disease Is Curable When Correctly Diagnosed and Properly Treated, J. Arkansas M. Soc. **38**:79 (Sept.) 1941.

Walker [190] discusses briefly the development of sinusitis during the course of a common cold. He seems to feel that vaccines have some value in the prevention of colds; at least they afford some degree of immunity against the bacterial agents involved.

Mathieu [191] offers a rather sketchy review of sinusitis covering etiology, symptomology, localization and therapy.

Nodine [192] finds that patients in whom there are a multitude of symptoms and a minimum of local findings referable to the sinuses are the most difficult to treat because the cause of the sinusitis may be obscure and frequently is a combination of allergy and endocrine disturbance. Among the items mentioned by the author that are worth repeating are the dangers of prolonged use of nasal solutions, especially the oily ones, and the indiscriminate probing of the frontal sinus without previous roentgen study.

Mahoney [193] summarizes his conclusions after eighteen years of practice in a small community and confesses that the more or less radical tendencies of his early years have given way to conservatism and that he finds that better results are obtained by this procedure. A physician living in closer proximity to his patients than one in a larger community has the opportunity of seeing and hearing from his patients much more frequently and therefore becomes more aware of the patient's reactions to treatment and the consequent comments that result. Despite his expressed conservatism he states that in cases of purulent antritis if the condition does not clear up after four or five irrigations an antrum window operation is indicated. He mentions also that he has not found it as easy to irrigate through the natural ostium as certain articles in the literature would suggest. In general the author agrees with most of the recent trends in sinus treatment and is aware of the importance of collaboration with the internist and pediatrician in many cases.

Allergy and Vasomotor Disturbances.—Houser [194] claims that 70 per cent of patients with nasal allergy will manifest symptoms of allergy in other parts of the body. A careful history is therefore extremely important when allergy is suspected in a patient with nasal symptoms. For convenience he classifies the conditions in such cases in the following groups: (1) suspect allergy; (2) definite allergy without demonstrable

190. Walker, A. M.: Cold in the Head: Its Effect on the Sinus, J. M. A. Alabama **11**:125 (Oct.) 1941.

191. Mathieu, C. T.: Les sinusites chez l'adulte, Union méd. du Canada **70**: 947 (Sept.) 1941.

192. Nodine, E. R.: Sinusitis, J. M. A. Alabama **10**:336 (April) 1941.

193. Mahoney, P. L.: Conservative Rhinology, J. Arkansas M. Soc. **38**:2 (June) 1941.

194. Houser, K. M.: The Importance of Recognition of Allergic Conditions by the Rhinologist, Ann. Otol., Rhin. & Laryng. **51**:514 (June) 1941.

sinus infection; (3) definite allergy with sinus infection; (4) definite allergy with polyposis, and (5) definite allergy with polyposis and sinus infection. Before the allergist is consulted it is important that all suspect cases be observed for a sufficient length of time to determine positively whether or not infection is present. If sinus infection is present it is necessary that neither the infection nor the allergy be neglected, since they are complementary to each other in the maintenance of the patient's symptoms. Pedunculated polyps should be removed. Sessile polyps usually indicate a strong allergic factor and require energetic investigation along those lines. The author feels that even the manifestly allergic patients can be relieved of considerable discomfort due to the nasal obstruction by the judicious use of agents that desensitize the mucosa, such as the galvanic current passed through an electrolyte or a mild caustic like chromic acid or trichloroacetic acid.

Shambaugh [195] stresses the frequency of allergy in chronic sinus disease, having found that in a series of 51 cases allergic factors were present in all but 8. He emphasizes the point that even when the allergic factor predominates one must not neglect to treat the infection. Simultaneous treatment of the allergy with local attention to the particular sinus in question will lead to a more prompt relief than if either is neglected in favor of the other.

King and King [196] describe a typical case to illustrate how the history is obtained and the diagnosis made when the symptoms first presented by the patient are indefinite. They point out the importance of inquiring as to family history and evidences of allergic traits in the patient himself. Also they stress the value of the smear of nasal secretions for eosinophils. It is particularly in the borderline cases that extreme care must be taken to extract from the patient the last bit of information regarding the character and duration of the symptoms and their relationship to vocation, habits, seasons and time of day. Incidentally, they attribute great value to the efficacy of contrast baths in the prevention of colds. Also, they call attention to the importance of proper humidity in living rooms during the season when artificial heating is at its height.

Glover [197] believes that an allergic nose must sooner or later be subject to infection because of the impairment of ventilation and ciliary activity caused by the allergic swelling of the tissues. It is therefore important to treat the infection actively as well as to employ measures to overcome the allergic state.

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195. Shambaugh, G. E., Jr.: Head Infections in the Practice of Medicine, J. Iowa M. Soc. **31**:373 (Aug.) 1941.

196. King, E., and King, J. H.: Diagnosis of Chronic Sinusitis and Allergic Rhinitis, Ohio State M. J. **37**:433 (May) 1941.

197. Glover, C. H.: Allergy and Its Relation to Sinusitis, J. Tennessee M. A. **34**:188 (May) 1941.

Spiesman [198] by means of a thermopile studied the temperature variations of the nasal mucosa during and following the application of cold to the back and found that normally there is a reduction in the temperature with a prompt return to normal depending on the duration and the amount of cutaneous surface cooled. Delay in the return to normal or an increase in temperature indicated an unstable vasomotor control, which in the author's experience with a number of cases was due to emotional and environmental factors. When these factors were eliminated the patients obtained relief from distressingly frequent attacks of infections of the upper respiratory tract. Typical cases are cited.

Headache.—Fenton [199] presents a rather philosophic discussion based on a study of newer trends in neurology pointing to the importance of the autonomic system in the protective mechanism of the body in general and the nasal apparatus in particular. While the autonomic system is itself not directly responsible for pain sensation, it may indirectly result in painful sensations through ischemia or stasis. Responses to allergens, pathogens, gases, extremes in humidity, etc., are examples of this mechanism. Also, the effects of fear, shock, anger, gastrointestinal upsets and pathologic gynecologic conditions may be manifest in altered nasal physiology, as has been observed time and again. Since autonomic responses are closely tied up with the function of the endocrine system, it is important that the otolaryngologist be familiar with their activities in order to understand the complex mechanism by which the nasal apparatus may be disturbed. The author feels that control of the autonomic endocrine and nerve systems and proper utilization of vitamins and distribution of hormones may prove to be the only means of adequately building up resistance to bacteria, viruses and other pathogens and controlling toxic inhibitions arising from harmful protein molecules.

McKenzie,[200] discussing the typical sinus headache and its importance in diagnosis, states that the pain of the acute variety is readily discernible and usually responds to therapy. Failure to respond promptly suggests complications, frequently of a serious nature. In chronic sinusitis headache is of minor importance except when it accompanies an acute exacerbation. Sphenopalatine headache may be confused with migraine but should readily be differentiated by the distribution of the radiating pains.

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198. Spiesman, I. G.: An Experimental and Clinical Study of the Common Cold, Ann. Otol., Rhin. & Laryng. **50**:1204 (Dec.) 1941.

199. Fenton, R. A.: Some Observations on Nasal Neurology, Ann. Otol., Rhin. & Laryng. **50**:492 (June) 1941.

200. McKenzie, W. R.: Headache of Nasal Sinus Origin: Its Interpretations, Dis. Eye, Ear, Nose & Throat **1**:87 (March) 1941.

In a rather exhaustive study of the nerve connections of the auditory and nasal apparatus, McLaurin [201] seeks to explain the mechanism of headaches arising from pathologic conditions in these regions. From the neurologic point of view the paper is a valuable contribution because of the wealth of material it contains and the accompanying illustrations. Concerning clinical deductions it would depend a great deal on the personal experience of the reader as to whether he would agree in toto with the author. Among the conclusions arrived at by the author are the following: Sinus disease, faulty ventilation to the sinuses and intranasal pressure account for the great number of headaches. Headache is likely to occur when the sinus ostium is blocked regardless of whether a vacuum is formed or not. Chronic sinusitis may exist with considerable pathologic changes and still cause no headaches. The degree of headache when present may depend a great deal on the type of patient. A study of the nerve pathways explains the location of headaches arising in certain sinuses and is helpful in making a diagnosis. The history in such cases may prove more valuable than the results of physical examination, transillumination and roentgen examination. Migraine is often mistaken for the headache of nasal origin but can be diagnosed by the absence of nasal or sinus lesions and the history of allergic tendencies. Nevertheless, it is extremely important to eliminate all possible foci of infection, since they frequently contribute to the maintenance of the attacks.

Frontal Sinus.—Lillie [202] reports a case of chronic nasal discharge which failed to ameliorate despite several operations on the maxillary sinus and ethmoid cells. The frontal sinus was apparently not at fault, because probing the duct and irrigation were fruitless. However, since the maxillary sinus appeared to be acting as a reservoir for pus reaching it from higher up, it was decided to open the frontal sinus. The operation disclosed an advanced stage of pathologic change, and what was of paramount interest was the fact that the real nasofrontal duct drained directly into the maxillary sinus, which of course explained the course of the symptoms. [This case was undoubtedly an instance of a fully developed maxillofrontal canal, as described by Mangabeira-Albernaz,[203] who credits Vilar Fiol with the first extensive study of this anomaly. S. S.]

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201. McLaurin, J. G.: Headaches of Otorhinologic Origin and Certain Reflexes Caused by Fifth Nerve Irritation, Ann. Otol., Rhin. & Laryng. **50**: 469 (June) 1941.

202. Lillie, H. I.: Discharge from Chronic Frontal Sinusitis Draining Directly into the Maxillary Sinus, Ann. Otol., Rhin. & Otol. **50**:572 (June) 1941.

203. Mangabeira-Albernaz, P.: O conduto maxilo-frontal, Rev. oto-laring. de São Paulo **4**:373 (Sept.) 1936; Le canal maxilo-frontal, Rev. de laring. **58**:77 (Jan.) 1937.

Van Alyea [204] reports a case of subacute frontal sinusitis of several months' standing secondary to an antrum infection of dental origin, which was cured by several irrigations after resection of the septum and infracting the middle turbinate. The author points to the efficacy of this combined treatment for conditions which have passed the acute stage but have not yet reached the chronic state of permanently altered mucosa. He also calls attention to the fact that in 25 per cent of all cases frontal drainage is impeded by an encroaching ethmoid cell, which must be removed if the sinus is to be properly drained and aerated.

Brown [205] presents a brief yet thorough review of frontal sinusitis from the practical point of view. It is interesting to note that he strongly advocates early trephining through the floor of the sinus in cases of severe acute sinusitis with fever, severe pain and tenderness which fail to yield to palliative treatment, a stand with which the reviewer is in hearty accord and which is the subject of a special contribution by Mulligan and Crowe.[188] The complications, including osteomyelitis, are all given adequate mention, and the modern concepts of therapy are clearly explained. While the article covers much familiar ground, it is well worth a careful reading because of its clarity, simplicity and brevity.

Titche [206] reviews a number of published cases of cerebrospinal rhinorrhea and discusses the various theories of its mechanism. He reports the case of a woman of 50 who for several months suffered from headache, nasal obstruction and a watery nasal discharge. The nasal fluid revealed 4 cells per cubic centimeter and other characteristics of cerebrospinal fluid. Roentgen examination failed to reveal any fracture lines but showed a definite hyperostosis of the internal table of the frontal bone and severe calcification of the posterior clinoid processes. The author believes that the discharge of fluid may have been due to actual tearing of the dura in the region of the cribriform plate or to separation of the dura from the bone in this location.

Williams [207] selected 28 cases of apparent endocrine dystrophy with symptoms of hirsutism, obesity and other dysfunction and found that in only 9 was there no roentgen ray evidence of bony disturbance of the skull bones. Among the 19 cases in which there was evidence there were a variety of bony changes which the author put into four main

204. Van Alyea, O. E.: Subacute Frontal Sinusitis, Ann. Otol., Rhin. & Laryng. **50**:570 (June) 1941.

205. Brown, J. M.: Frontal Sinusitis, Ann. Otol., Rhin. & Laryng. **50**:435 (June) 1941.

206. Titche, L. L.: Cerebrospinal Rhinorrhea: Report of a Case Presenting Hyperostosis Frontalis Interna, Ann. Otol., Rhin. & Laryng. **50**:554 (June) 1941.

207. Williams, C. L.: Hyperostosis of the Calvarium, J. Indiana M. A. **34**: 361 (July) 1941.

groups, the largest number being those of hyperostosis frontalis interna. He discusses the various theories as to causation and concludes that until more is known of the pathogenesis the treatment must necessarily be symptomatic.

Roth [208] reports 8 cases of hyperostosis frontalis interna, discusses the literature and offers his own impressions as to causation and pathogenesis. In his series he believes that the neurologic symptoms were due not to pressure of the increased bone on the brain but rather to cerebral arteriosclerosis and pituitary dysfunction. The anterior lobe of the gland was usually affected. He suggests as a reason for the predominance of the disease in females and for the most frequent sites the increased permeability of the barrier between the spinal fluid and the blood, favoring the deposit of calcium salts in those areas where the flow of cerebrospinal fluid is slowest, namely, the points of greatest curvature within the skull. He points out also that an increase of the permeability of the barrier is noted during pregnancy and during the menstrual period and cites some experimental work on this subject.

Klaer [209] reviews the literature of hyperostosis frontalis interna and reports 3 cases. He is of the opinion that the endocrine theory of causation is probably the most justifiable but has no additional proof to offer in support of his contention.

Ethmosphenoid Disease.—Felderman [210] describes a syndrome of vocal fatigue with huskiness, pharyngeal paresthesias and tympanic membrane hyperemia, the result of accumulation of secretions in the hypopharynx and valleculae by gravity from chronic ethmosphenoid disease. Locally he finds the pharynx spastic and reddened, secretion in the valleculae often overflowing into the larynx, occasional congestion of the vocal cords, redness of Shrapnell's membrane and at times some secretion in the nasopharynx. He claims that frequently roentgenograms of the sinuses are not reliable and a close study must be made of the mucosa of the middle and superior meatuses as well as of the nasopharynx for evidence of the source of the secretion. He recommends that a patient with such a condition be treated nonsurgically except for the removal of grossly infected tonsils or the correction of contributing obstructing lesions. The endocrine, allergic and vitamin status of the patient must be given consideration, and then locally one may use a mild germicide, such as silver picrate 0.2 to 0.1 per cent

208. Roth, N.: The Syndrome of Internal Frontal Hyperostosis: Report of Eight Cases, Am. J. Psychiat. **98**:63 (July) 1941.

209. Klaer, W. W.: Three Cases of Hyperostosis Frontalis Interna, Ugesk. f. læger **103**:672 (May 22) 1941.

210. Felderman, L.: Ethmo-Sphenoidal Epiglottidean Syndrome Interfering with Voice Dynamics, Dis. Eye, Ear, Nose & Throat **1**:300 (Oct.) 1941.

in 7.5 per cent dextrose solution. In some cases it is advisable to prepare an autogenous vaccine.

Diseases of the Maxillary Sinus.—Berry [211] has paid a great deal of attention to the relationship between infections of the teeth and pathologic conditions of the sinuses over a period of years and records some interesting data. He has found that the routine use of a dental transilluminator has revealed infection in and about the teeth which has explained to him the obscure pains and other symptoms referable to the sinuses and has led to elimination of the offending focus with relief to the patient. This diagnostic procedure when followed up by roentgenograms and vitality tests has rewarded him in many cases with a correct diagnosis and prompt cure of the patient's complaint. In a large series of cases of antrum disease in which the teeth were investigated he found that in about 20 per cent there were proved pathologic conditions of the teeth and in another 35 per cent probable abnormalities. His experience has shown that when dead teeth are present below an infected antrum they should be extracted if proved to be abscessed, except in the presence of acute infections. The diseased bone should be gently curetted even if it entails the formation of a fistula into the antrum. In most cases the fistula will heal without further work on the antrum being necessary. When the pathologic changes within the antrum have progressed beyond a certain point it may be necessary to do a Caldwell-Luc operation. If there is a dead tooth beneath the antrum floor and it is not abscessed, it should be removed if the intervening bone is thin. Should this bone be thick enough to present an adequate barrier to the possible spread of infection upward, it may be treated conservatively.

Dalmark [212] gives a long detailed dissertation on the effect of the radical antrum operation on the sensitivity of the teeth as determined by accurate measurements with a special apparatus which measures the threshold of perception and the duration of perception of the stimulus. This is accomplished by a procedure he calls *Chronaxie*. The method was to examine 35 patients with 251 teeth before operation, recording the sensation reactions and repeating the procedure at intervals after the operation of one to two weeks, one to two months and six months. Also postoperative roentgenograms were taken. The technical details are rather involved, especially the computation of the results, but the conclusions reached were that although there is a temporary impairment of sensation there is no loss of vitality in the teeth and therefore no contraindication to the operation on this score.

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211. Berry, G.: Some Dental Observations by an Otolaryngologist, Ann. Otol., Rhin. & Laryng. **50**:995 (Dec.) 1941.

212. Dalmark, G.: Ruft die radikale Kieferhöhenoperation Zahnbeschädigungen herfor? Acta oto-laryng. **28**:549, 1940.

Rabkin [213] points out the close relationship of the roots of the molar teeth to the floor of the antrum and shows that when the palatal arch is flat the bone is apt to be thinner than when the arch is high. He shows several illustrations in which the bony covering of the tooth roots is paper thin and even completely absent. Disease of the teeth is a malady of civilization, since modern food entails a minimum of tooth and jaw labor, which accounts for inferior development, as compared with that of the uncivilized man of former days. He describes the changes that take place in alveolar bone as a result of alveolitis or pyorrhea but fails to demonstrate how this condition may affect the antrum except by inference. [There seems to be some difference in opinion among dentists as to the likelihood of an alveolitis being responsible for antrum infection. Pathologic evidence to date has been rather meager. S. S.]

Through bacteriologic studies of mucous membranes removed from the antrums at operation compared with similar studies of extracted teeth, Grove and Welch [214] failed to reveal any relationship that might be interpreted as effect and cause. Dental roots were ground up and cultured. Of 160 such specimens examined, 10 per cent showed the presence of hemolytic streptococci. Streptococcus viridans was the organism more frequently found, being present in 80 per cent. Staphylococcus occurred in 31.7 per cent and pneumococcus in 5.4 per cent, whereas cultures of the antrum mucosa revealed two to three times the frequency of hemolytic streptococci. Tables accompany the article showing the frequency of various bacteria in root cultures, ground tip cultures and cultures of antrum mucosa.

Parker [215] discusses various aspects of the relationship of dental to antrum infection and presents several unusual cases. He feels that the history is the greatest single diagnostic factor in assessing the condition present. In his experience pain has been an unreliable symptom. If a tooth root escapes into the antrum it should be removed through the Caldwell-Luc approach. The author blocks the second branch of the trigeminal nerve through the external subzygomatic approach and gives detailed directions for executing this maneuver.

Millhon and Williams [216] report a rather complicated case of dentigerous cyst associated with an unerupted third molar projecting into

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213. Rabkin, S.: Suppurative Alveolitis and Its Effect on the Maxillary Sinus, Laryngoscope **51**:811 (Aug.) 1941.

214. Grove, R. C., and Welch, J. C.: The Bacteriologic Relationship of Dental Infection and Chronic Hyperplastic Sinusitis, Laryngoscope **51**:263 (March) 1941.

215. Parker, R.: The Maxillary Antrum and Its Dental Aspects, J. Am. Dent. A. **28**:1794 (Nov.) 1941.

216. Millhon, J. A., and Williams, H. L.: A So-Called Tooth Antrum in the Left Maxilla: Foreign Body in the Antrum and an Unerupted Third Molar; Report of a Case, Proc. Staff Meet., Mayo Clin. **16**:694 (Oct. 29) 1941.

the antrum, which was confusing because of a history of a previous extraction of a first molar in which one root was broken off and left in situ. The procedure followed was to expose the third molar first and using it as a landmark to search for the lone root of the first molar, which was found not to have penetrated the antrum. The third molar was then removed and with it the cyst, after which an antrum window was made for drainage and the alveolar wounds closed.

Tokashiki [217] reports a case in which a long-standing antrum infection was cured by opening the antrum and removing an unerupted third molar which was present in the sinus and was revealed in the roentgenograms.

Quittner and Aronzonas [218] attribute the sinus infection in their case to infection of the root canals of the two premolar teeth, symptoms of which had been present for four years, culminating in a well defined sinusitis. The symptoms subsided when the root canals were cleaned out and properly filled.

Arai and Okamoto [219] report the case of a girl aged 10 years who for several months complained of nasal block and epistaxis on one side. The symptoms suggested a sequestrum, but roentgenograms revealed an incisor tooth which had eroded into the nasal cavity.

Sai [220] cites 3 cases of odontogenic sinus disease. Case 1 was that of a man of 60 with swelling of the cheek and nasal block. Diagnosis of osteomyelitis of the superior maxilla and odontogenic sinusitis was made after extraction of a carious incisor. A radical operation was performed, with recovery. In case 2 a woman of 55 had a subperiosteal abscess of the upper jaw and floor of the nose following extraction of a canine tooth. An operation was performed, with recovery. The third case was that of a 4 year old girl with an odontogenic abscess of the septum following removal of a canine tooth.

Batt [221] presents 2 interesting cases of mycotic infection of the sinuses, in 1 case involving the antrum of a woman of 44 and in the other the frontal sinus of a woman of 46. In the first case there was a history of pulmonary infection some twenty years previously and coughing up of a large gob of dried blood, which unfortunately was not analyzed. The sinus infection was treated for years, and finally an operation was done, with the Denker method, disclosing the antrum filled

217. Tokashiki, I.: Ein Fall von zurückgebliebenem Zahn in der Kieferhöhle, Oto-rhino-laryng. (Abstr. Sect.) **14**:9, 1941.

218. Quittner, J., and Aronzonas, J.: A Case of Maxillary Sinusitis of Dental Origin, Medicina, Kaunas **22**:246 (Feb.) 1941.

219. Arai, A., and Okamoto, T.: Ein Fall von inversiertem Zahn in die Nasenhöhle, der an Sequesterbildung denken liess, Oto-rhino-laryng. **14**:9, 1941.

220. Sai, S.: Drei Fälle von odontogenen Nasenkrankheiten, Nebstanhang: über das Problem von Sinusitis, Oto-rhino-laryng. **14**:74 (Feb.) 1941.

221. Batt, F.: Aspergillosis and Other Mycoses in the Sinuses of the Nose, Acta oto-laryng. **29**:129, 1941.

with a thick pultaceous mass which on examination revealed aspergillus myceliums; also, the mucosa in places showed a metaplasia to pavement epithelium. The author believes there may have been a direct connection between the pulmonary condition and the sinus disease. In the second case an external operation for chronic hyperplastic frontal sinusitis revealed the sinus filled with fungus masses which on microscopic examination showed gram-positive threads arranged in palisade formation and bundles penetrating into leukocytic masses like a brush or pencil. The photomicrographs are very clear and instructive.

TergHeege [222] reports 3 cases of maxillary sinusitis occurring in the Netherland East Indies which were characterized by a foul discharge. Since there were no carious teeth as possible cause, the author believes this finding rather unusual. He found an anaerobic bacillus of the coli group, which might easily find entrance and develop rapidly in an already infected cavity, particularly in the warm humid tropical climate.

Rohn [223] states that although rhinoliths in the nasal cavity are not uncommon, their presence in the sinuses has been but rarely noted. The case he cites from his own experience was that of a woman of 33 who complained of pains in the cervical region radiating to the ear, pain in the nose and a purulent discharge. Roentgen studies revealed a small rounded shadow in the center of the antrum close to the nasal side which was not clearly outlined. Lateral projection gave the shadow more of an oval outline apparently about 0.5 cm. above the sinus floor. The sinus was opened, which disclosed much foul pus and polypoid mucosa in which there was embedded a round dark foreign body that looked like a stone. Its surface was irregular, and it measured 1.1 by 1 by 1 cm. When sectioned it revealed concentric layers of dark grayish green surrounding a central core that was grayish white. Histologic section showed the presence of a ball of cotton embedded in amorphous crumbly masses. Apparently this thread served as the nidus about which the amorphous masses accumulated. The author believes the foreign body reached the antrum through a tooth socket after a previous extraction, the pledget evidently having been lost in the socket. Also, the floor of the antrum must have been opened in the extraction. The author finds only 19 cases of stones in the antrum in the literature and refers to an article by Oppikofer in 1908 reporting 5 cases. The author presents abstracts of the previously published cases. In 3 of them the stones were formed from foreign bodies introduced (snuff, tobacco, small pieces of wood and fragment of a tooth). Theories as to

222. TergHeege, F. H.: A Tropical Form of Acute Maxillary Sinusitis, Geneesk. tijdschr. v. Nederl.-Indië **81**:1721 (Aug. 12) 1941.

223. Rohn, K.: Ueber Rhinolithen der Kieferhöhle, Hals-, Nasen- u. Ohrenarzt (Teil 2) **50**:1 (June) 1940.

formation of the others are numerous, such as drying thick secretion, caseous secretion and cholesteatoma.

Another case of a forein body is reported by Hutcheson.[224] A woman of 51 had nasal symptoms for two years. They began with mild postnasal discharge followed by nasal obstruction and fetid odor and lastly swelling of the cheek. Examination revealed the inferior turbinate replaced by a reddish friable bleeding mass, the anterior wall of the sinus bulging. Roentgen studies showed the sinus occupied by a dense mass and the nasoantral wall eroded. A sublabial incision into the sinus revealed it to be filled with cholesteatoma, pus and granulations. The nasoantral wall was eroded and filled with granulations, in the midst of which there was a grayish black laminated stone about 1 inch (2.5 cm.) in length and diameter. Examination of the stone for a nidus failed to disclose anything more than a small cavity near the center, which suggested to the author that it might have been originally a clot of blood or pus. He also believes, with St. Clair Thompson, that the salts forming the bulk of the stone came from the tears rather than the mucus, because of the location of the mass near the end of the nasal duct.

McGovern [225] reports 2 cases of air embolism following antrum irrigation, with a fatal result in 1. A man of 24 had his antrum punctured through the inferior meatus with a Lichtwitz needle, the air being insufflated after the irrigation. The patient immediately had a convulsion, and the breathing became stertorous and soon ceased. The other case was that of a woman of 24 whose antrum was irrigated through the middle meatus with a blunt cannula which entered without much difficulty. Air was insufflated after the irrigation, and this was immediately followed by a severe generalized convulsion and stertorous breathing. After partial recovery from the convulsion the patient remained in partial coma with marked restlessness. Physical examination revealed hyperactive knee reflexes, slight weakness of the left arm and hand and slight edema of the face and lids on the right side. The patient recovered completely within a week. The author refers to similar cases in the literature and adds a word of caution regarding trauma during an irrigation and the employment of air except under very low pressure.

Vreeland [226] claims to have been unable to find any record of nasal hemorrhage originating in the maxillary sinus and reports the case of a man of 55 who was a diabetic. [Hall and Thomas [227] reported 12

224. Hutcheson, J. R.: A Case of Rhinolith Combined with Cholesteatoma of the Maxillary Antrum, M. J. Australia **1**:451 (April 12) 1941.

225. McGovern, F. H.: Cerebral Air Embolism Following Antral Irrigation, Arch. Otolaryng. **34**:593 (Sept.) 1941.

226. Vreeland, R. J.: Nasal Hemorrhage Originating in the Maxillary Sinus, J. M. Soc. New Jersey **38**:473 (Sept.) 1941.

227. Hall, S. S., and Thomas, H. V.: Spontaneous Hemorrhage into the Maxillary Sinus, Arch. Otolaryng. **28**:371 (Sept.) 1938.

cases of spontaneous nasal hemorrhage originating in the antrum. S. S.] The epistaxis was severe, and the author was able to see the blood coming from beneath the middle turbinate. Experimental puncture of the sinus revealed pure blood. After the bleeding had been controlled by packing he was able to introduce an antroscope, revealing a large mass, which was later successfully removed.

Furrer, Stanard and Kuykendall [228] report a very unusual case, with a fatal result. A woman aged 23 with chronic postnasal discharge was treated and relieved to a great extent by displacement irrigation, 8 cc. of Locke's solution with 0.5 per cent ephedrine being used, with a suction pressure of 17 to 20 mm. of mercury. Treatments were given at long intervals over several months. The patient came in ten months later complaining of pain over the left eye. A diagnosis of frontal sinusitis was made. She was given displacement treatment. Three days later there was numbness in the right hand, which subsided the next day. Later the same day there was flaccid paralysis of the right arm and forearm, and two hours later, paralysis of the face, right hand and right leg. She became unconscious. On the next day, in the hospital, her temperature was 102 F. and she was restless and anxious. The fundi were normal, and examination of the spinal fluid showed pressure of 44 mm. of water and no cellular changes. The white blood cell count was normal. There were muscular rigidity, opisthotonos and convulsions the next day, followed by cyanosis and death. Autopsy showed softening of the left parietotemporal lobe and blood clots in venous sinuses about the pacchionian bodies on the left side. The right sphenoid and ethmoid sinuses were filled with clotted blood. The authors believe that the changes in the brain antedated the last two treatments and were due to thrombophlebitis of veins of the dura from absorption of infective material of the sinuses. However, they feel that the blood in the sinuses was the result of the displacement irrigation.

Herberts [229] states that tuberculosis of the maxillary sinus is very rare, only 27 cases having been reported up to 1938. The reason cited for this rarity is the fact that the mucosa of the sinuses is particularly resistant and is remote from possible contamination. The antrum can be affected by continuity from the eye, nose or teeth, the last-named source being the most common. Hematogenous infection has been noted in only 4 cases. Three types are known, according to Fallas, who is cited by the author: 1. In the "larval form" the mucosa alone is affected and presents a slack and polypoid form distinguishable from hyperplastic sinusitis or a foreign body reaction by careful histologic examination.

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228. Furrer, E. D.; Stanard, D. C., and Kuykendall, J.: Hemorrhage into the Paranasal Sinuses Following Suction Displacement Irrigation, Arch. Otolaryng. **33**:305 (Feb.) 1941.

229. Herberts, G.: Tuberculosis in the Maxillary Sinus, Acta oto-laryng. **29**:297, 1941.

2. In the second type the bone is affected and fistulization is common. Tuberculosis of the lungs is frequently present. 3. The third, tuberculoma, is extremely rare; only 1 case was cited by the author. Type 1 is clinically primary and is characterized by its tendency to persist despite treatment or surgical intervention. Cervical adenitis is a common symptom, and bone pains radiating to the neck have been noted. The second type, with fistula, resembles a chronic osteomyelitis and may be mistaken for syphilis or actinomycosis. In the 27 cases published, 8 patients were cured, the remainder dying within a short time after the disease was discovered. The author's case was that of a woman of 63 with no history of tuberculosis except that she worked in a family where there had recently been a fatal case of the disease. Her early history suggested this condition, but the diagnosis had not been made. She had a suspicious nodule in the neck, and roentgen examination of the sinuses revealed cloudiness and involvement of the bone and also some lesions in the lungs suggesting healed tuberculosis. The gland of the neck was removed, and the antrum was operated on with the Caldwell-Luc technic. In both places the tissues showed caseation and pus. Histologically tuberculosis was proved. Primary healing took place, and examination a few months later showed the general condition to be improved. While the sinus still looked cloudy, there was no evidence of further osseous involvement.

Fractures.—Iglauer [230] summarizes the indications for surgical intervention in acute sinusitis, acute exacerbations of chronic sinusitis and chronic sinusitis in accordance with the generally accepted modern conceptions. He includes a few helpful hints regarding the care of fractures and gunshot wounds involving the sinuses which under present circumstances should be very helpful. Citing Dandy and Kazanjian, he points out that fractures involving the frontal or ethmoid sinuses should be regarded as compound fractures of the cranial cavity and treated as such. Wounds of the overlying soft tissues become infected within twenty-four hours unless necessary precautions are taken. This means early cleansing and removal of clots and foreign material before closing. A clot in the antrum, however, he says, need not be removed unless infected. Escape of cerebrospinal fluid or the appearance of air in the cranial cavity are grave symptoms, and the patient must be observed closely for symptoms of beginning meningitis, which would be an indication for prompt and extensive exposure. If there has been a history of a preexisting sinusitis, one would be justified in opening widely to prevent spread of the infection intracranially.

Echols and Holcombe [231] report a case in which a man injured in an automobile accident had a fracture of the frontal bone. Rhinorrhea

230. Iglauer, S.: Indications for Surgery in Nasal Sinus Disease, Dis. Eye, Ear, Nose & Throat **1**:143 (May) 1941.

231. Echols, D. H., and Holcombe, R. G.: Traumatic Intracerebral Pneumatocele: Report of a Case, South. Surgeon **10**:589 (Aug.) 1941.

was not observed, and the man recovered after a period of observation lasting about one week. Headaches persisted, although the man was able to return to work. After sixteen and a half months he experienced two mild convulsive seizures without loss of consciousness. A third seizure was accompanied by loss of consciousness. Two months later he manifested a weakness of the limbs on one side. Roentgenograms revealed a large pneumatocele in the frontal lobe. An osteoplastic flap was turned down; this exposed the frontal lobe, which appeared cystic. The latter was opened, and a smooth-lined cavity was revealed with a stalk leading down to the cribriform region. Elevation of the lobe exposed "a string of gelatinous tissue 2 cm. in length lying beside the nerve in the olfactory groove and connecting the under surface of the frontal lobe with the cribriform plate." This tract was destroyed with the cautery, and the small opening in the dura was packed with a piece of temporalis muscle. The cystic space was filled with saline solution and the wound closed. The patient made a perfect recovery. The author cites Dandy as stating that 40 per cent of the patients with such conditions die if untreated, whereas Zyl is cited as having found that 28 per cent recover spontaneously.

Miscellaneous.—Pittman's contribution [232] is concerned mainly with the tubotympanic disturbances among fliers. He states that the sinuses are less frequently and less markedly involved because their ostiums are much shorter passages than the eustachian tube and therefore less likely to become obstructed by changes in air pressure. However, he points out that it is important that the flier have normal air passages, and therefore it is necessary to see that obstructions, such as deviated septums, polyps, tumors and allergic manifestations are removed.

Orr [233] claims that many conditions diagnosed and treated as sinusitis do not come within this category, as proved in a series of cases which he studied. In a group of 310 cases of symptoms suggesting sinus involvement careful analysis showed that 152 could be excluded on the basis of repeated examination. In most of these cases it was shown that the symptoms were due to metabolic, endocrine or allergic factors, elimination of which brought relief. He emphasizes the importance of properly evaluating the roentgenograms, using a contrast medium when in doubt. Also, he shows that in many cases the continued employment of nose drops and local treatment was responsible for the continuance of the annoying discharge and stuffiness of which so many complained. Cases illustrating the factors mentioned are cited.

Torrini [234] reports a case of fibrinous rhinosinusitis in a man of 40 which appeared a few days after an attack of influenza, during which

232. Pittman, C. D.: The Middle Ear and Accessory Nasal Sinuses from a Flight Surgeon's Point of View, Ann. Otol., Rhin. & Laryng. **50**:518 (June) 1941.

233. Orr, E.: Pseudo-Sinusitis, J. Tennessee M. A. **34**:83 (March) 1941.

234. Torrini, G.: Sopra un caso di rino-sinusite fibrinosa, Boll. d. mal. d. orecchia, d. gola, d. naso **58**:441 (Dec.) 1940.

the patient had had severe supraorbital pain, pains in the joints and fever. After a brief remission, the pains and fever returned, with right nasal block and swelling of the cheek and lids extending over the temporal area. The right nasal cavity was found to be filled with a grayish pink membrane that fitted the intranasal structures "like a glove." The bulb became proptosed and the lids and conjunctiva chemotic. On removal of the membrane the nasal mucosa was found to be intensely inflamed and a small amount of secretion was present in the middle meatus. Because of the threatening orbital symptoms the ethmoid sinuses were exenterated and the antrum opened sublabially. The latter was found to be lined with the same fibrinous membrane as the nasal cavity proper. Cultures revealed staphylococci and short chain streptococci. The membrane itself consisted of bundles of fibrils in colonies of leukocytes and red blood cells. Examination of the mucous membrane revealed nothing characteristic beyond the usual findings of a severe acute process. The author cites similar cases reported in the literature and concludes that the process is attributable not to any definite organism but rather to the common pathogenic organisms of the region which for reasons as yet unexplained suddenly manifest unusual virulence and the power to produce a fibrinous reaction in the tissues attacked.

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Abstracts from Current Literature

Ear

OBSERVATIONS ON THE ETIOLOGY AND TREATMENT OF MÉNIÈRE'S SYNDROME. MILES ATKINSON, J. A. M. A. **116**:1753 (April 19) 1941.

Atkinson discusses in full detail the mechanism of the Ménière syndrome, suggesting two causes, one allergy, and the other vasospasm. He believes that the failure in many cases to obtain favorable results with treatment could be explained on the basis that but one cause was searched for to suit all cases, whereas at least two causes should be thoroughly investigated from every angle.

The author considers the allergic group first, with full comments on the histamine cutaneous test, the therapeutic response, et cetera, after which he discusses the vasoconstrictor group and describes tests with vasodilator substances and other therapeutic measures.

The syndrome is described, and the pathologic processes involved in the vasomotor disturbance are fully detailed, with queries on the probable genesis of the vasospasm. Differential diagnoses are given.

The author concludes his paper by an outline of treatment based on the diagnostic observations. He views the theory of infection with skepticism. Eustachian stricture, when found, should be treated energetically to promote the normal balance of air pressure in the middle ear. The improvement of ventilation through the tube might also help by virtue of its massage effect.

GORDON, Philadelphia.

AERO-OTITIS MEDIA IN COMPRESSED AIR WORKERS: TREATMENT WITH HELIUM-OXYGEN MIXTURES. W. H. REQUARTH, J. A. M. A. **116**:1766 (April 19) 1941.

The author observed some time ago that aero-otitis media occurred more frequently in the industrial groups in which workers were surrounded by compressed air than among aviators. Tubal blockage or impaired ventilation of the middle ear by the eustachian tube is the primary factor involved.

The anatomic and pathologic physiology of the middle ear, including ventilation of the eustachian tube, role of the membrana tympani and pressure changes, is fully discussed. Etiologic factors are considered, with especial emphasis on infection of the upper respiratory tract.

Prophylaxis, the history of previous experience in compressed air, the presence of sinusitis, otitis media, badly fitting dental plates or occlusions, otoscopic inspection, elimination of the worker if any acute infection of the upper respiratory tract is present, the question of teaching each worker to perform the Valsalva inflation in order to open the ears at designated increases of compressed air, these and related topics are fully discussed.

The technic of helium-oxygen administration is given. It was concluded that helium-oxygen mixtures afforded complete relief from tubal blockage in 55 per cent and moderate relief in 19 per cent of the patients. The 26 per cent of failures corresponds roughly to the percentage of ear drums which showed evidence of perforation, gross fluid in the middle ear or extensive changes in the drum itself. The efficacy of the gas is limited to patients with little or no change in the tympanic membrane and little or no fluid in the middle ear.

GORDON, Philadelphia.

PROGRESSIVE ANALOGOUS NERVE DEAFNESS IN THREE SUCCESSIVE GENERATIONS WITH SEX-LIMITED INHERITANCE. MATTHEW S. ERSNER and MAURICE SALTZMAN, Laryngoscope **51**:241 (March) 1941.

Ersner and Saltzman report the occurrence of cases of familial deafness in three generations: in a daughter, aged 11; in her mother, aged 35 and in her grandmother, aged 62. Each suffered from progressive loss of hearing, most marked for high notes, which began in the right ear in each instance. Each afflicted person had one or more brothers with normal hearing. The grandmother had 1 deaf sister.

WOOD, Newark, N. J.

DEAFNESS IN CHILDREN. EDMUND PRINCE FOWLER, New York State J. Med. **41**:1543 (Aug. 1) 1941.

This report was made before the pediatric section of the New York Academy of Medicine on Jan. 9, 1941. Although deafness is widespread, it is "appalling how little is done to prevent it." Fowler and his associates tested 1,200,000 school children in New York city and found 4 per cent with hearing losses of 9 decibels for "speech hearing." He estimated that one third of all school children have a hearing loss of 15 decibels for some frequency. Children love noises, firecrackers, etc.; therefore, they may suffer otologic concussion without visible signs. It is difficult to test a baby's hearing, but if he is given a toy that makes a noise, he will express satisfaction. He may, to be sure, fail to hear in one ear. One may test with a tuning fork or may shout 2 feet (60 cm.) from the ear. If a sound of 80 decibels is not heard, speech hearing is probably lost. If a baby is crying he will stop if a tuning fork is brought near the ear or applied to the skull—a fork of 512 double vibrations gives less "feeling." Up to 8 or 10 years of age deafness may not be noticed if it is merely unilateral. Nasopharyngeal causes, such as adenoids, should be eliminated and the patency of the tubes determined. But inflation is "practically never indicated in infancy or childhood."

As for incision of the drum, Fowler is inclined to wait in the hope that drainage from the tube will take place. He avoids repeated incisions, favoring rather posterior incision (simple mastoidectomy) when drainage is insufficient. Thus hearing may be saved. He does not advise giving sulfanilamide to every patient, but recommends its use only after sufficient drainage has been established. One may be able to show as good results without it as with it.

Severe head colds are always accompanied by nasal sinusitis, which may involve the tubes and middle ears, even though the sinuses are small and not well developed. Fowler looks on the middle ears as "sinuses of the nose." The nose may clear, but the otitis may persist. One should make sure that no such focus remains. In any case one should avoid meddlesome medical and surgical treatment and should individualize the therapy according to the patient's and the family history. The hereditary tendency to deafness may exist, but environment plays the larger part. Repeated exposures to trauma or infection will overcome any immunity eventually.

As for meningitis, anticipatory or preventive management is all important, and prompt and efficient treatment by the newer methods is imperative in preventing meningeal involvement of the eighth nerve. Even in the case of a severely deafened ear loud sounds may act as trauma to destroy the remaining cells along the neuroauditory paths.

Mumps causes deafness, but no one knows exactly how. The infection possibly may follow the facial canal, being carried along the facial nerve, but why is the seventh nerve so seldom paralyzed in this disease? Mumps is usually unilateral and is not commonly suppurative. Aural involvement seldom takes place before 12 years of age, but thereafter it is likely to occur. Nausea, vomiting and deafness are too often ascribed to gastrointestinal trouble in cases of mumps. These symptoms may well be of aural origin. If so, deafness usually supervenes in the second week of parotitis. The first symptom may be violent ringing in the ears. If present it is a warning of degeneration to come.

Syphilis is not often a cause of acquired deafness in children. A positive Wassermann reaction may be merely coincidental, but the use of arsenicals may make deafness sure and permanent. In any case the most satisfactory treatment of deafness will always be preventive.

VOORHEES, New York.

A NEW AURICULAR SYNDROME OF ARTERIAL HYPERTENSION. ARISTIDES MONTEIRO, Rev. brasil de oto-rino-laring. **7**:325 (July-Aug.) 1939.

Monteiro called attention to the prominence of the artery surrounding the head of the malleus. The presence of the phenomenon should suggest the possibility of generalized arterial hypertension. In a review of 75 cases of arterial hypertension, he found that many of the patients showed prominence of this artery. In patients with severe tinnitus and prominence of this artery, one should suspect arterial hypertension; on the other hand, in a patient with permanent severe hypertension the sudden appearance of prominence of this artery should suggest an impending arterial break, either in the brain or elsewhere. He found that this sign was present in 92 per cent of plethoric persons with hypertension. The sign is also noted in patients with disturbances of the sympathetic or parasympathetic systems. He considers its presence as of greater significance when there are associated symptoms, such as tinnitus, vertigo and hypacousis. In most of the patients who underwent treatment for hypotension or who had suffered a spontaneous hemorrhage this vascular sign disappeared, thus showing the relation of the sign to arterial hypertension.

PERSKY, Philadelphia.

PACCHIONIAN GRANULATIONS IN THE REGION OF THE PETROUS TIP AND THEIR OTOLOGIC IMPORTANCE. R. PODESTA, Monatschr. f. Ohrenh. **75**:109 (March) 1941.

The localization of pacchionian granulations is of importance, as not only tumor but hernia of the brain may arise from them. Previous study of their localization places them not only along the sinuses but at the nerve canals at the base of the skull. However, their importance around the petrous tip has been insufficiently stressed. A number of authors who described pacchionian granulations in the middle fossa are cited, but localization in the posterior fossa seems rare. In a survey of hernias of the brain the author states that they occurred both with and without increased intracranial pressure and frequently were closely associated with pacchionian granulations, especially in the region of the petrous tip. The importance of hernia of the brain as an avenue of infection is well known. It was deemed necessary, therefore, to study the localization of the pacchionian granulations in the region of the petrous tip, where most hernias of the brain are seen. A series of eleven photomicrographs supports the contention that pacchionian granulations are found only in the region of the cavum Meckelii, especially in its lateral and medial wall, most often in close relation to the cavernous sinus. Only once were they observed on the cerebral surface, along the stem of the inferior maxillary nerve. As the region studied contains the maximum number of venous vessels at the base of the skull, it was to be expected that these veins would contain a great number of pacchionian granulations. Their close proximity to bone marrow spaces or to cells of the pyramid of the temporal bone readily gives rise to a spreading infection. This spread does not always occur from the infected bone into the granulation; but sometimes retrograde infection takes place, as was demonstrated by the author in 1 case. Surgical separation of the pacchionian granulations from the underlying bone (Streit's operation) may easily open up infected spaces and spread the infection. The pacchionian granulations studied were of different sizes; some contained more connective tissue and others more endothelial elements. Their exclusive localization is the region of Meckel's cavity, around and within the great veins. Podesta noted no direct contact between pacchionian granulations and the mucosa of the pneumatic cells, but he emphasizes their close relation to the marrow spaces, by way of the venous system.

LEDERER, Chicago.

EXPECTANT TREATMENT OF SKULL FRACTURE WITH INVOLVEMENT OF THE EAR. W. SCHMIDT, Monatschr. f. Ohrenh. **75**:126 (March) 1941.

Two theories of treatment are advocated for the management of skull fracture when combined with involvement of the ear: radical surgical intervention, as advocated by Voss, and conservative therapy. At the Münster clinic indications for operative intervention are: (1) signs of intracranial complication; (2) evidence of suppuration in the spinal fluid following a previously clear fluid and (3) fracture involving a suppurating ear. Radical operation is then performed. Expectant observation and management are indicated when the ear has remained closed or when the tympanic membrane has been perforated, but the general condition has remained good and no signs of complication are noted. The author reports on 4 patients treated conservatively with successful results despite the fact that the middle ear became infected. The suppuration subsided, and all of the patients recovered. The author emphasizes the importance of observing such patients at a clinic, so that no symptom is overlooked.

LEDERER, Chicago.

DISTURBANCES OF HEARING IN SYRINGOBULBIA. K. FALKENBERG, Monatschr. f. Ohrenh. **75**:242 (May) 1941.

Disturbance of hearing and subjective ear noises are rarely observed in cases of syringobulbia. This is a corollary to the statement of the extreme rarity of central acoustic lesions in bulbar processes. Of 7 patients observed at the Vienna clinic, 4 showed signs of disturbance in hearing of a retrolabyrinthine type. Two of these patients evidenced such defects on the side of the lesion, and in 2 instances they were bilateral. Pathoanatomically, it is likely that the fissure formation is not so much responsible for the lesion as are the accompanying glia formation and vascular changes.

LEDERER, Chicago.

Pharynx

HISTOPATHOLOGICAL CHANGES OCCURRING IN CHRONIC INFECTION OF THE PHARYNX. HARRY P. SCHENCK, Ann. Otol., Rhin. & Laryng. **50**:817 (Sept.) 1941.

Lymph follicles scattered throughout the pharynx are an integral part of Waldeyer's ring, but study of them has been neglected, even though they are subject to the same influences and infections as other lymphoid tissue. They are susceptible to acute and chronic infections; to changes associated with allergy, and to alterations accompanying leukemia, granulocytopenia, infectious mononucleosis, pernicious anemia, polycythemia, purpura haemorrhagica and Hodgkin's disease. A clear distinction must be made between pathologic alterations due to systemic disease and those resulting from primary involvement of the pharynx itself. When chronic disease is primary the pathologic changes occur almost exclusively in the lymph follicles. Any accompanying alterations in the surrounding tissues are secondary to the follicular involvement. The gross and microscopic changes depend entirely on the duration of the disease, the organism involved and the immunologic characteristics of the patient. In examining for chronic pharyngeal infection the entire pharynx, from the base of the skull to the lower border of the larynx, should be gone over. During chronic infection the changes consist mainly of alterations in the lymphatic structures, and the solitary nodes first exhibit marked hyperplasia with infiltration of polymorphonuclears and later fibroblasts appear. Extensive vacuolation of the epithelial cells follows, with considerable attrition, so that one or two layers of cells may be all that remain where there are usually fifteen to twenty. In spite of this, ulceration is usually absent. Numerous crypts appearing in the pharyngeal lymphoid tissue indicate chronic involvement. In chronic inflammation of the pharynx the mucous glands become conspicuous, owing to numerical increase of alveoli without other obvious changes, and often the enlargement of the lateral bands is due to this, and not

directly to hyperplasia. When fibrosis develops later, these glands atrophy. The sinuses play an important part in infection, and reinfection of the pharyngeal lymphoid tissue and the spraying of the area with secretions from below the larynx are important factors. Nasal obstruction is an important predisposing factor.

M. V. MILLER, Philadelphia.

STREPTOCOCCI IN AIR AS AN INDICATOR OF NASOPHARYNGEAL CONTAMINATION. JOHN C. TORREY and MICHAEL LAKE, J. A. M. A. **117**:1425 (Oct. 25) 1941.

The authors have conducted an elaborate study of the bacterial content of the air, especially the streptococcic. Similar studies had previously been undertaken by other investigators in schools, theaters, subways, railway cars, textile factories and hospitals, largely in New York, Boston and Iowa City.

The present study was carried out in a department store which is the largest, and at times the most crowded, in the world. An attempt was made to correlate the density of crowds with the degree of bacterial pollution of the air, in relation not only to total bacterial counts but especially to the numbers of streptococci of nasopharyngeal origin; to determine seasonal variations in respect to such data, and to plot the prevalence rate for disabling colds among employees in relation to the numbers of streptococci in the air during the course of a year.

The authors summarize their study as follows: "Bacterial analyses of the air of a large department store carried out with the Wells air centrifuge during the course of a year have shown a marked correlation between the numbers of streptococci of respiratory origin recovered from the air and the prevailing rate of colds as indicated by the medical records for the employees. This finding tends to substantiate the suggestion of Wells that the alpha hemolytic streptococcus may well be taken as an indicator of pollution of the air by nasopharyngeal discharges in a manner similar to that in which Esch. coli has been accepted as an indicator of pollution of water supplies by sewage.

"The prevalence of streptococci and that of colds were at a minimum in the summer months. The first rise in both curves occurred in October, and then, following a drop in November, there occurred a steady rise to a peak in January and February. The streptococcic content of the air apparently was influenced to a greater proportional degree by the prevalence of colds than by the density of crowds. The store was by far the most crowded during December, yet the total count of streptococci was increased only slightly over that for October and was far lower than that for February, when the prevalence of colds reached a peak for the year.

"A closer parallelism in the curves for colds and for streptococci in the air was in evidence when alpha and gamma types were combined than when alpha types alone were considered. This was particularly true for January and February.

GORDON, Philadelphia.

TREATMENT OF SIALOLITHIASIS OF THE SUBMANDIBULAR GLAND. F. PRIETZEL, Monatschr. f. Ohrenh. **75**:216 (April) 1941.

The reasons for the formation of sialolithiasis are still not clear, but in general the condition is attributed to inflammation of the salivary gland and duct accompanied by stasis of saliva, thus favoring the growth of bacteria and changes in the salivary contents. This forms the nucleus for the deposition of salts and, finally, the formation of the stone. The majority (82 per cent) of these stones are found in the submaxillary gland, which is more accessible to trauma. While a number of authors advise complete removal of the gland, a certain restriction is advised by Trendelenburg, the extirpation being limited to chronically diseased glands. In 6 patients observed at the clinic the stone was removed by incision of the duct and no recurrence was observed. In 3 patients the gland was removed. These 3 patients complained of dryness in the mouth after resection, and 2 of them also stated that they experienced numbness of the tongue. This is attributed

to resection of the submaxillary ganglion in the course of the operation, thus severing the parasympathetic fibers, which run from the chorda tympani and submaxillary ganglion to the lingual nerve and stimulate the production of thin mucus. Disturbance of these fibers causes dryness. The numbness of the tongue results from injury to the lingual nerve during the resection of the gland, which is usually adherent.

LEDERER, Chicago.

Miscellaneous

RESUSCITATION OF THE ASPHYXIATED NEWBORN INFANT. J. D. RUSS and ROBERT STRONG, Am. J. Dis. Child. **61**:1 (Jan.) 1941.

A series of 1,200 newborn babies were studied, for 196 of whom resuscitation was necessary. A newer classification of asphyxia is presented—mild, moderate and severe. In cases of the last type the upper respiratory tract has become a collapsed tube. Causal factors include maternal conditions, such as the toxemia of pregnancy, heart disease and prepartal analgesia. Primiparas present far more babies with asphyxia than do multiparas. Infants delivered by cesarian section show a higher percentage of asphyxia.

The pediatrician is present to receive the baby if delivery is by high or mid forceps, cesarian section, version and extraction or breech extraction; if the fetal heart beat is above 160 or below 100, or if toxicity of the mother or premature separation of the placenta indicates need for resuscitation.

The author recommends the use of alpha lobeline via the umbilical vein.

ROBERT B. LEWY, Chicago.

CHRONIC ULCERATIONS OF THE NOSE AND THROAT. HAROLD LIEBERMAN, New England J. Med. **225**:132 (July 24) 1941.

Chromic acid and its compounds for many years have been known to produce ulcerations and perforations of the nasal septum. This subject has been studied for many years, the first observations having been recorded over a century ago.

Workers in the chromium plating industry, especially those under poor working conditions, are exposed to inhalations of chromic acid. This is irritating and corrosive to the mucosa of the nose and throat. Small particles of chromic salts, when inhaled, are deposited on the septal mucous membrane, leading to paralysis of ciliary activity, ulceration and perforation of the cartilaginous septum.

Symptoms and signs of chronic poisoning are excessive sneezing, epiphora and a profuse watery nasal discharge. Dizziness, weakness and dull headache are common. Later a thick postnasal discharge and heavy nasal crusts appear, and finally septal ulceration and perforation.

The pharynx is congested, with deposits of dirty, gray, tenacious mucus; sometimes the pharyngeal wall is dry and red and appears glazed. Frequently small, multiple, sharply demarcated ulcers with a pseudomembrane are present on the soft palate, the tongue and the floor of the mouth. Sooner or later in all patients "chronic holes" develop in the skin of the hands. These ulcerations are very slow in healing, requiring from four to eight weeks.

Response to treatment is slow but sure; therapeutic measures consist of cleansing the nose and the postnasal space and applications of a bland ointment to the affected parts. Most important, however, is elimination of the existing hazard under poor working conditions.

SCHALL, Boston.

Society Transactions

THE MONTREAL MEDICO-CHIRURGICAL SOCIETY, SECTION OF OTOLARYNGOLOGY

D. H. Ballon, M.D., *President*

E. A. Stuart, M.D., *Abstract Editor*

April 16, 1941

Problems of Aviation Medicine Relating to Ear, Nose and Throat. Dr. J. B. Whaley, Squadron Leader, R.C.A.F., Toronto, Canada.

The problems of aviation medicine relating to the ear, nose and throat are few, but much confusion is present among specialists on this subject. The physical standards for admission to the Royal Canadian Air Force are not generally known, and there is a vague idea that recruits must be supermen and have extraordinary qualities of the ears, nose and throat, particularly the ears. I hope, in this short paper, to clarify some of these misunderstandings.

Before proceding with a discussion of these problems, I shall outline the setup for the early training of the young airman. From the recruiting center the successful applicant goes to the Manning depot, or pool. He stays here about one month and then goes out on security guard for two months. From there he comes to the initial training school, where he remains about four weeks, before being sent to an elementary flying school to begin his training in the air. My contact with the men has been mostly at the medical selection board at No. 1 Initial Training School, at Toronto. We of the medical examining board are lodged in the medical hut, which contains, besides the medical selection board, the clinical investigation unit, with its decompression chamber, the cold chamber and other research devices, and the psychologic unit. Of main interest to us is the decompression chamber. This is a large tank which holds about 12 men, and the oxygen may be removed from it until partial pressures are reached which simulate oxygen pressures up to an altitude of 40,000 feet (12 kilometers) or more. It is equipped with oxygen lines and individual masks, so that each man may breathe oxygen at a pressure above that of the 15,000 foot (4.5 kilometer) level. The men are taken into the tank, and the air is gradually evacuated.

Tests are made with pressures equivalent to those at the 5,000 foot (1.5 kilometer) and the 17,000 foot (5.1 kilometer) levels. After ten minutes the oxygen masks are put on, and more air is withdrawn until a partial pressure of oxygen equivalent to that at an altitude of 25,000 feet (7.6 kilometers) is reached. Other tests are done here, and then the descent to the pressures at the ground level is begun by allowing the air to flow back into the tank. At other times various experiments are carried out by research workers with oxygen pressures as high as those equivalent to an altitude of 40,000 feet (12 kilometers).

SELECTION

The problem of selection is the first, and probably the most important. A candidate for flying must be young and in the best of health in every respect. The examination carried out is a complete physical one, plus some specialized tests. This also holds for the ear, nose and throat. As for the ears, the drums must be intact; even a dry perforation disqualifies; the hearing must be within normal limits, and the eustachian tubes must be patent and functioning normally. The nose must be clean and healthy—no marked obstruction on either side; no chronic sinusitis or polypi. Atrophic rhinitis is a cause for rejection. The mouth

and throat must be reasonably healthy, with no pronounced dental caries or gingivitis; the tonsils, if badly diseased, should be removed before the candidate is accepted. The nasopharynx and larynx must come within the bounds of normal health.

There are several reasons for the aforementioned standards.

Ears.—Perforation of a drum disqualifies because the change in altitude effects a change in air pressure in the middle ear. With one drum perforated, this rapid change could cause dizziness or an upset in equilibrium. If both drums were perforated, this probably would not happen. Also, the repeated trauma of changing air pressure in the middle ear would rapidly set up infection. A simple mastoidectomy, properly done, should give a normally functioning ear, and persons who have had this operation and have normal hearing and intact drums are accepted. Radical mastoidectomy, no matter how good the result or how perfect the hearing, is a cause for rejection, for obvious reasons. The hearing must be normal because planes fly on the beam and contact the ground by radio and the personnel communicate with each other from various positions on the aircraft by a telephonic system. All fliers used to become deaf to high tones after many hours of flying; so good hearing was necessary at the beginning. Also, hearing must be normal because at times aviators fly by the sound of the motor, the ping of the guy wires, the rush of the slip stream, and so on, but it is inadvisable to rely on this too much, as a false impression of speed may be obtained when one is flying out of clouds, as a result of a change in density of the medium, or when there is inequality between the pressure of air in the middle ear and that of the outside atmosphere. We consider a man to have normal hearing if when each ear is tested separately he hears a tuning fork of 64 double vibrations, one of 4096 double vibrations and the whispered voice at 20 feet (6 meters). These criteria are recognized as rough tests for hearing in view of modern methods, but if he is able to hear within these limits, for all practical purposes in the air force his hearing is satisfactory. I think I can safely say that about 95 per cent of men with this hearing acuity would be found to have normal hearing no matter what devices were used, for they are young men.

The eustachian tubes may be considered to be patent if the drums have a healthy appearance and the hearing is normal. If there is any doubt, the patency may be tested by having the candidate inflate his ears by Valsalva's method, and the examiner listens with an auscultation tube for a puff of air, or he may watch the drum for movement, which occurs in 50 per cent of cases or less. Rinne and Weber tests may also be carried out.

Nose.—Deviation of the septum is disregarded unless it is almost blocking one side, and then a submucous resection is advised before acceptance, because a complete obstruction affects the eustachian tube on that side. We have had it happen. Chronic infection of the sinuses, particularly the antrums and frontal sinuses, is a source of real trouble in flying, owing to the interchange of air which takes place at varying altitudes. A latent condition is easily stirred into an acute exacerbation. Nasal polypi, in addition to being a sign of chronic disease, tend to interfere with the rapid interchange of air through the ostiums of the sinuses. When a few polypi are present, and arise from the ethmoid area, and the sinuses are all clear on transillumination or roentgenographic examination, the recruit is accepted if the polypi are removed. We have had several cases of this type. Atrophic rhinitis usually has an effect on the eustachian tubes, as well as often being accompanied by chronic disease of the sinuses. Also, because of the ever present odor, persons with this condition are not ideal subjects for barrack-room life.

Throat.—Unless the tonsils are grossly diseased, the men are accepted without being sent home for a tonsillectomy. If the throat is very bad, the operation is advised before acceptance. About 50 per cent of recruits have had their tonsils removed in childhood, and the operation has been well done in nearly every case. Most of the tonsillectomies were performed by general practitioners, and during the last fifteen years, and represent all Canada.

HEALTH AND MAINTENANCE

The general problem of health and maintenance of health in the Air Force does not differ from the health problem of any large group of men living together in an institution or in barracks. The ear, nose and throat conditions are those commonly found anywhere, and are mostly the result of infection of the upper respiratory tract. Every man, after he had been at the Manning depot a short time, had pharyngitis or tonsillitis or both. This was due to several factors. The men come from across Canada, those from the West being immune to their local organisms but susceptible to those from the East, and vice versa. Also barrack life, even with the correct allotment of air space, is a crowded condition compared with the usual home surroundings of the young recruits. Once the men get out onto flying fields these infections rapidly disappear, and the health generally is good.

SPECIAL EAR, NOSE AND THROAT PROBLEMS

Nose.—There are no special problems if the previously mentioned standards of selection are carried out. A healthy mucous membrane is able to allow for increased ventilation at high altitudes, where there is a low partial pressure of oxygen, and for warming the air. This is necessary because the temperature generally drops 2 degrees C. for every 1,000 feet (300 meters) above an altitude of 3,000 feet (900 meters) until the 35,000 foot (10.5 kilometer) level is reached, and then the temperature remains constant at —55 C. for all altitudes above this. (Recently temperatures lower than this have been recorded at altitudes below 35,000 feet [10.5 kilometers].) Occasionally when a cold is present, rapid descent causes a "sinus pain," most commonly over one of the frontal sinuses. It is a so-called vacuum pain and is due to swelling of the nasofrontal duct. It passes off shortly after landing, when the air gradually seeps back into the sinus. This is aided by spraying the nose with ephedrine.

Ears.—There are, or were, three main problems in aviation connected with the ears: deafness, aero-otitis-media and air sickness.

Deafness: As mentioned previously, all fliers used to become deaf to high tones after many hours of flying. The deafness begins above 4096 double vibrations, but may progress to lower tones. All the important sounds produced by an aircraft are made up from notes below 1000 double vibrations; in fact, most are below 700 double vibrations. Yet the deafness is for high tones. Apparently, low-pitched noise causes high tone deafness. It is known that the pathology of traumatic deafness is not yet understood, and this condition fits in with such a picture, for the deafness certainly does not obey the laws of Helmholtz' theory of hearing. As McNaughton-Jones and others have shown, sound waves are continually pounding on the promontory and being dispersed by it; so it is possible that the continual trauma produced by extremely loud sounds, which are approaching the threshold of pain, affects that part of the basilar membrane which lies just within the promontory, causing rupture of supporting ligaments, degeneration of cells, or what not. This part of the basilar membrane has to do with high tones. However, all this is only a guess.

The deafness which is produced is at first only temporary, and passes off after a few hours on the ground. But repeated exposures gradually cause the permanent deafness already mentioned. As well as this exhaustion of the eighth nerve, general fatigue of the whole body is produced by noise. So it is important that noise in aircraft be reduced to a minimum. The main noise in a plane is produced by the exhaust and the propeller tip. When the speed of the propeller tip approaches that of sound, i. e., 1,089 feet (332 meters) per second, the noise produced suddenly increases greatly. Also, when of the two sources of noise one is removed, the resultant sound is lessened only slightly; that is, the noise is not halved, as one might expect, but reduced only a rather slight degree, in this case about 3 decibels. So the futility of going over an aircraft to try to silence each sound at its source is evident. Of course, the answer lies in soundproofing the

cabin, or cockpit. Few airplanes today have an open cockpit. Some of the smaller training machines, such as the Fleets and Moths, are open, but the majority have a sliding hood, which, among other things, cuts out a good deal of the noise. Tightly fitting helmets, with attached ear phones, are worn by all the members of the air crew, and these also add to the reduction of the extraneous sound. The helmet, with its ear phones, is the best ear defender yet found, and it allows the hearing of communications when necessary.

Aero-Otitis-Media: Aero-otitis-media is traumatic inflammation of the middle ear caused by a difference in air pressure on the two sides of the drum. Level flight at no time causes any inconvenience to the human body even if the speed were 1,000 miles per hour, but the moment there is a deviation of the course from this level trouble begins. The "blackout" and other conditions produced by centrifugal force are met with, and in ascending or descending a change in the air pressure in the middle ear occurs. Commercial aircraft, on approaching an airdrome, descend at the rate of 200 to 300 feet (60 to 90 meters) per minute, and so little trouble in the ears is experienced. Dive bombers, on the other hand, descend at the rate of 300 to 400 miles (480 to 640 kilometers) per hour, i. e., 26,000 to 35,000 feet (8 to 10.5 kilometers) per minute. Here the eustachian tubes take a terrific beating.

As one ascends in an airplane, the air contained in the middle ear may be felt to "squirt" into the pharynx from the eustachian tube. This happens about every 500 feet (150 meters). Usually no difficulty is encountered on climbing unless there is some mechanical obstruction to the tube, such as a congenital or other narrowing of the isthmus or lymphoid tissue or scarring in or about the orifice. Most of the experimental work we have done has been in the decompression chamber, and I have "gone up" at the rate of 100,000 feet (30.5 kilometers) per minute without giving a thought to my ears. The descent, however, is a different story. Here the air does not reenter the eustachian tube involuntarily, but the tubes must be opened by swallowing, moving the jaw about, shouting or forcible inflation by Valsalva's method. When a young pilot is diving a bomber at a rate of 300 miles (480 kilometers) an hour and yelling his head off, he is not crazy —he is simply restoring the atmospheric pressure in his middle ears. When the air is unable to get into the middle ear, the aforementioned aero-otitis-media occurs. There are several degrees of severity of this condition. The earliest and simplest is slight reddening of the periphery of the drum and of the handle of the malleus. The only distinguishing feature between this aviation condition and early otitis media is the fairly pronounced indrawing of the drum. A more advanced, or more severe, stage shows diffuse reddening of the drum with fluid bubbles present on the inner surface. Later still a fluid level may occur. The fluid is a transudate, and as such has a black line on top, due to old blood cells, and some air is always present. If infection should occur, the transudate becomes an exudate and the middle ear cavity is completely filled. This is similar to the change occurring from a blocked tube due to any cause. Another picture sometimes presented is that of a severely bruised drum and is due to hemorrhage between the layers of the membrane. An outstanding feature of aero-otitis-media is the suddenness of onset. I have "gone up" in the decompression chamber with groups of airmen to watch the development of this affliction, and the moment one complained of pain in the ears I examined them and always found the redness. A descent from a 15,000 feet (4.5 kilometers) to the ground level without the opening of the eustachian tube will rupture an ear drum. Fortunately, this is an uncommon occurrence, and I know of only 1 case in which training was stopped for this reason.

Treatment of Aero-Otitis-Media: A few words might be said here about the treatment of aero-otitis-media, which is conservative. Every attempt is made to help the condition to clear itself, without any surgical intervention, such as paracentesis. If the inflammation is in the very early stage, it is probably best left alone. Any treatment in more advanced stages is directed at the eustachian

tube. The nose should be sprayed frequently with a 1 per cent solution of ephedrine, and applicators dipped in the solution may be gently pushed through the nose and allowed to lie against the eustachian orifice and cushion for ten minutes or so. Warm irrigations of the nose and throat with a solution of sodium chloride sometimes lessen the congestion and often add to the comfort of the patient. If, after several days, the condition has not cleared, inflation by means of a eustachian catheter may help; this usually removes any remaining deafness that may result. Should an infection occur and the middle ear fill with pus, paracentesis of the ear drum is necessary.

Aero-otitis-media is commoner in the decompression chamber than in actual flying. In the early part of training many of the men have colds or are recovering from them, and this adds to the danger. Also, talks are given on the management of the ears and on the physiology of flight, and this bears fruit later. The fact that ear trouble in the R.C.A.F. is much less than might be expected is due, we think, to the experience the airmen gain in the decompression tank, the lectures they receive and the lectures given at the School of Aviation Medicine, which every medical officer attends on entering the service.

Air Sickness: Air sickness is a condition marked by nausea, vomiting, vertigo, pallor, sweating and fear which is produced in flight as a result of acceleration and change in position of the aircraft. Important books on aviation medicine say, in effect, that "air sickness is entirely an inner ear problem." After coming in contact and working with this problem for a year, I should say that the inner ear has nothing at all, or very little, to do with air sickness. It is true that most of the men with this affliction have a history of car sickness and train sickness in childhood, but these same men give a history of timidity, restlessness, fear of the dark, enuresis and other signs of emotional instability, which cannot be placed against an easily disturbed labyrinth. In the past, a few persons with dead labyrinths were taken for flights and did not get airsick, but any number of persons with normal internal ears have never been airsick either. However, it is known that in examining deaf-mute children, when differentiating between congenital and acquired deafness, one spins them in a Bárány chair. The children with congenital deafness have a normal after-nystagmus and do not feel very happy about the maneuver, but those with acquired deafness, in whom the whole inner ear is destroyed, have no after-nystagmus, are delighted with the whole proceeding and want more. So it is possible that the labyrinth may play a small part, and such patients are usually said to have an "inherent vestibular instability," which I am afraid is akin to the medical term "idiopathic."

Air sickness was thought to be commoner in air observers than in pilots. This is due to the fact that the observer has more time to think about himself; his mind not being centered on the controls, as is the pilot's, he is looking off in the distance and toward the ground, and he is not aware of sudden changes in direction of the aircraft before they occur. With this in mind, I did caloric tests on one school of 115 observers before they left our station. Of this group, only 3 reacted abnormally either by early and marked nystagmus or by general objective signs. This school then left for the flying field, where I was able to follow them up. The 3 hypersensitive men had no air sickness whatever. A few cases of air sickness occurred among those who gave normal caloric responses. The majority of men who ceased training because of air sickness whom we have studied have been from elementary flying training schools, and these were nearly all pilots. The commonest cause, by far, is some emotional upset, such as fear, unconscious or otherwise, difficulty with the instructor or unhappy circumstances at home. Psychologists and psychiatrists have been a real help here. In the remainder of the cases the origin is apparently splanchnic, and experimental work with various drugs and other means is now proceeding along this line.

And so the general problems in the Air Force are many, and although one is a specialist in diseases of the ear, nose and throat, one must also be a specialist in aviation medicine.

Review of Cases of Acute Suppurative Otitis Media at the Royal Victoria Hospital and the Montreal General Hospital in 1940, with Comparative Analyses for 1937, 1938 and 1939. DR. G. E. M. HILTON and DR. E. A. STUART.

The results of the analyses are presented in the form of a tabulation.

Cases of Acute Suppurative Otitis Media in Which Recovery Occurred Without Operation

	1937	1938	1939	1940
Streptococcus haemolyticus	33	31	35	26
Str. haemolyticus combined with Staphylococcus	15	8	9	5
Anhemolytic streptococcus	4	1	1	1
Streptococcus viridans	0	0	1	....
Pneumococcus type III	4	4	12	14
Pneumococcus (other types)	7	12	23	15
Staphylococcus pyogenes	11	28	31	16
Staph. epidermidis albus	5	0	5	1
Haemophilus influenzae	1	2	1	1
Diphtheroids	1	1	1	1
Micrococci	1	3	1	6
Bacillus proteus	1	0	3	....
Bacillus pyocyaneus	0	0	2	4
B. pyocyaneus and B. proteus	1	0	0	....
No bacterial growth	2	1	5	3
No culture	52	23	16	7
Bacillus alcalescens faecalis and Bacillus coli were associated in 1 case each				
Total	138	114	146	100

Cases in Which Mastoidectomy Was Required

	1937	1938	1939	1940
Str. haemolyticus	60	64	46	33
Str. haemolyticus combined with Staphylococcus	6	5	6	8
Anhemolytic streptococcus	2	2	0	3
Pneumococcus type III	16	26	19	7
Pneumococcus (other types)	5	6	4	4
Staph. pyogenes	4	12	5	10
Staph. epidermidis albus	1	0	1	3
H. influenzae	0	1	0	0
Diphtheroids	0	0	1	1
Micrococci	1	0	1	2
Neisseria flava	1	0	0	0
B. proteus	2	1	0	4
Friedländer's bacillus	0	1	0	0
B. pyocyaneus	0	1	0	2
No bacterial growth	7	10	3	2
No culture	18	12	2	3
Bacillus morgani	0	0	0	1
Total	123	141	88	88

Cases of Myringotomy

	Mastoid Operation		Recovery Without Operation	
	Myringotomy	No Myringotomy	Myringotomy	No Myringotomy
1937				
Streptococcus	35	33	36	10
Pneumococcus type III	4	12	4	....
Pneumococcus (other types)	2	4	4	2
Staphylococcus	3	2	12	3
1938				
Streptococcus	26	45	24	16
Pneumococcus type III	14	12	4	....
Pneumococcus (other types)	3	3	12	....
Staphylococcus	4	8	18	9
1939				
Streptococcus	15	37	26	18
Pneumococcus type III	3	16	10	2
Pneumococcus (other types)	1	3	17	6
Staphylococcus	2	3	24	9
1940				
Streptococcus	6	38	13	18
Pneumococcus type III	3	4	7	7
Pneumococcus (other types)	2	1	11	4
Staphylococcus	4	11	11	11

Complications of Acute Suppurative Otitis Media, 1940

	Age, Yr.	Sex	Cerebrospinal Fluid	Outcome
Meningitis				
Str. haemolyticus (followed fracture of petrous bone, associated with dead labyrinth)	8½	♂	No growth	Recovery
Str. haemolyticus	33	♀	Positive	Recovery
Str. haemolyticus	9	♀	No growth	Recovery
Str. haemolyticus (associated with pyogenic lesion of knee and epileptogenic focus on left side)	30	♀	Positive	Recovery
Str. haemolyticus (associated with acute nephritis)	7	♀	No growth	Recovery
Pneumococcus type III	44	♀	Positive	Recovery
Pneumococcus type ? with B. proteus (associated with abscess of temporal lobe)	30	♀	No report	Death
Thrombosis of Lateral Sinus				
Str. haemolyticus (associated with abscess of left pectoralis muscle)	21	♂	Positive blood culture	Recovery
Facial Paralysis				
No culture	4	...	.....	Recovery
Serous Labyrinthitis				
Pneumococcus type III	44	♂	.....	Recovery
von Bezold's Abscess				
Str. haemolyticus	14	♂	.....	Recovery
Subperiosteal Abscess				
Str. haemolyticus	5½ wk.	...	.....	Recovery
Str. haemolyticus	2 mo.	...	.....	Recovery
Str. haemolyticus	30	...	.....	Recovery
No culture	4	...	.....	Recovery
No culture	9	...	.....	Recovery
Thrombophlebitis of Leg				
Staph. epidermidis albus	63	♂	.....	Recovery
Infantile Tetany and Bronchopneumonia				
No culture	17 days	♂	.....	Death

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY

JEROME STRAUSS, M.D., *President*

Regular Meeting, March 2, 1942

Roentgenographic Studies on Mastoid Lesions. DR. JOHN H. GILMORE.

Information derived from roentgenographic study of the mastoid process may be: (*A*) anatomic, revealing (1) the extent of mastoid development, (2) the type and distribution of cells, (3) the position of the sinus wall and the emissary vein and (4) unusual anatomic variations; (*B*) pathologic, revealing: (1) the presence of inflammation, recent or old or both, (2) bone destruction, if present, and its location and (3) the presence of cholesteatoma or other neoplasms, or (*C*) postoperative, indicating (1) the extent of cell extirpation and (2) the presence of persistent infection and granulations.

Since the advent of sulfanilamide therapy roentgenographic studies have become increasingly important. The hospital roentgenologist no longer sees acute fulminating mastoiditis, but he encounters peculiar chronic conditions of the mastoid and infections of the middle ear which have been resistant to treatment. Caution must be used in the correlation of clinical and roentgenographic data when sulfanilamide and its derivatives are being used. Serial study is of great assistance.

I use a third position in all examinations of the mastoid. In cases in which there is a history of acute or recent infection the Taylor or submentovertex, position is employed, and in cases of chronic infection a modification of the Chamberlain-Towne, or vertex-suboccipital, position is used. From roentgenograms taken with the patient in the last-named position much information may be obtained concerning the presence of cholesteatoma. A number of pictures are shown to demonstrate that a pathologic condition in the mastoid may be overlooked if exposure in the third position is omitted.

Differential diagnosis of observations in the vertex-suboccipital projection must consider the following possibilities: 1. A large antral space may satisfy the diagnostic criterion of cholesteatoma from a roentgenologic standpoint but at operation be found not to contain such a tumor; in such cases spontaneous evacuation into the middle ear and auditory canal through a large perforation may have occurred. 2. An anatomically large antrum is likely to be associated with a poorly developed or an underdeveloped mastoid. 3. Chronic infection in and about the antrum without the presence of a cholesteatoma may in time produce a large antrum; however, the margins will be indistinct and irregular. 4. The emissary vein over the antral region may be so magnified as to give a false impression of a large antrum. 5. A malignant growth in the mastoid process may give the appearance of an enlarged antrum; surrounding destruction of an irregular nature and other clinical signs aid in the differentiation.

Roentgen studies of the mastoid process in cases of obscure disease often aid in identifying localized destruction of bone, and the evidence may be the deciding factor in favor of surgical intervention. The use of a third position in routine roentgenographic examination may assist in detecting with a greater degree of certainty the presence of a cholesteatoma. The roentgenogram is almost indispensable in the proper management of a patient with suspected acute mastoiditis who is under treatment with a drug of the sulfanilamide group.

DISCUSSION

DR. C. H. CHRISTOPH: Dr. Gilmore has discussed mastoiditis from the roentgenologist's point of view; I shall consider it from the clinical standpoint. It is true that one can make a diagnosis of mastoiditis without roentgenograms. The typical picture of mastoiditis, with the protruding ear, sinking of the posterosuperior bony wall, pain and tenderness, elevation of temperature and leukocytosis, can be recognized by any medical student. It is the unusual forms that require roentgen corroboration—those with a normal ear drum, normal blood count, no pain or little fever. Even after the diagnosis is made, it is essential to know the dis-

tribution of the cells, the development of the mastoid, the location and extent of the area of necrosis, the position of the lateral sinus and the condition of the petrous pyramid in the particular case.

At the Illinois Eye and Ear Infirmary, during the past five years my associates and I have done more than 200 mastoidectomies; of these, about 30 per cent were radical operations, in about 70 per cent of which Dr. Gilmore's diagnosis was that of cholesteatoma. With few exceptions this diagnosis was verified at the operating table. I believe many cases of this lesion were missed prior to his use of the third position.

Another type for the diagnosis of which the roentgenogram is of value is otitis media which has been under management with chemotherapy. There is often improvement in clinical symptoms—lessening of pain, temperature and discharge—while the pathologic process is steadily progressing to bone necrosis. This Dr. Gilmore has proved by serial roentgenograms. In all the cases aforementioned from one to four roentgenograms were taken; I think serial studies are of the utmost importance.

Dr. Alfred Lewy: It was hard to convince me that the roentgenographic evidence was more reliable than the clinical symptoms in determining whether or not surgical intervention was indicated in cases of mastoiditis. So far as acute mastoiditis is concerned I am still unconvinced, except in cases in which sulfanilamide therapy has been given. In many such cases the clinical indications are obscured, and when I have followed Dr. Gilmore's interpretation I have been glad that I did so. I should like to ask him whether he has been able to confirm Law's observation that sulfanilamide produces a deceptive appearance of the cell structure of the mastoid.

The one condition in which roentgenography has been particularly valuable is in the cases of chronic suppurative mastoiditis in which there is doubt as to whether surgical treatment should be attempted or whether therapy should be conservative. In the clinic my associates and I are inclined to consider such doubtful cases as surgical, for otherwise the condition might be neglected when the patient was away from our care; clinic patients do not come in regularly enough for treatment. A patient who could be treated successfully in the office by conservative methods might not be properly managed in the clinic.

It was largely my suggestion that the basal plate be taken routinely, so that we might have the picture if the question of petrositis should arise. It has proved valuable in study of the antrum in cases of a suspected cholesteatoma.

Dr. John R. Lindsay: There is no question about the value of roentgenograms in the diagnosis of any type of suppuration of the mastoid. In the case of acute suppurative disease it is well to realize what information one desires and expects to obtain from roentgenographic study. First, one hopes to determine the extent of the air cell system of the middle ear. In a consideration of otitis media, one should think in terms of a middle ear system of air cells rather than simply of a middle ear and a mastoid, and one can expect the roentgenogram to show the extent of the air cell system, whether it is limited to the mastoid, as occurs in two thirds of cases, or whether it extends into the perilabyrinthine or other regions of the pyramid. This is the primary requirement of a good roentgenogram of the temporal bone. Second, one hopes to obtain information as to whether the air cell system is normal or diseased. Definite evidence as to whether a breakdown of cells has occurred is not always afforded with certainty by the roentgenogram. However, it is only in rare cases that one depends on roentgenologic information to indicate the necessity for operation. The primary aim in a roentgenographic examination should be to demonstrate the air cell system in all its extensions.

Dr. John H. Gilmore: Dr. Lewy asked about Law's observations on the trabecular intensification in the mastoid process after the use of the sulfanilamide drugs in cases of acute mastoiditis. I have observed this change. I started a series of confirmatory observations, but about that time I began to see very few cases of acute mastoiditis. Dr. Lewy mentioned the assistance the third positon has afforded. I started to use the Taylor position, but as I could not see as much as

I wanted of the chronically infected mastoid I changed to the modification of the Chamberlain-Towne position.

I have seen petrositis in cases in which little pathologic change was evident externally (no involvement of the mastoid). In such cases, information concerning the petrous bone may be obtained more readily by the Taylor position than by the modification of the Chamberlain-Towne position.

I agree with Dr. Lindsay. In cases in which the patient is clinically well immediately after acute mastoiditis but in which one cannot be sure that bone destruction is not progressing, roentgenographic examination is decidedly helpful.

Encephalomeningocele in the Nasal Cavity. Dr. Oliver B. McGillicuddy, Lansing, Mich.

Encephalomeningocele in the nasal cavity is rare. There are only 9 authentic cases in the literature, and in all but 2 death occurred from meningitis following operation. The lesion is a cystic tumor containing brain tissue, meninges and cerebrospinal fluid, enclosed in fibrous walls and covered with nasal mucosa. In the infant it may completely block one naris and pulsate with the brain. The mass is usually connected with the brain by a pedicle that passes through a dehiscence in the cribriform plate. Occasionally the cerebrospinal fluid flows directly from a ventricle into the cystic tumor.

This tumor must not be confused with glioma, which is a neoplasm without developmental error, while the encephalomeningocele is a developmental error without neoplasia. Diagnosis is difficult, as the growth may resemble a fibroma or polyp. It is probable that in many cases the cyst is thought to be a polyp and is removed in the office, with resulting meningitis and death. Autopsy may reveal a dehiscence in the cribriform plate, but the tumor has usually been discarded without examination. The surgeon should be wary of cases of polyp in children, of a history of cerebrospinal rhinorrhea, which is usually associated with this lesion, and of pedicles that lead above the middle turbinate body.

After the diagnosis has been made, it is questionable whether the tumor should be removed. If surgical intervention is decided on, an intracranial approach seems most logical. Closure of the usual large dehiscence in the cribriform plate presents a difficult problem however, and challenges the neurosurgeon to find some method of obliterating the defect. The intranasal removal, together with the use of sulfanilamide or one of its derivatives, leaves the defect blocked by a pedicle, but may open a cyst that leads directly into a ventricle.

REPORT OF A CASE

A boy aged 13 years had a large intranasal encephalomeningocele, which was firm and fibrous. Operation was performed because it protruded from his nose and caused disfigurement, so that he shunned school and society. An intranasal approach was used, together with administration of a sulfonamide compound. The boy did well for a year; then meningitis developed, from which he recovered with chemotherapy. He is now well except for slight rhinorrhea. His parents have refused the advice of a neurosurgeon to remove the pedicle and attempt to close the dehiscence in the cribriform plate.

DISCUSSION

Dr. Samuel J. Pearlman: There is little to add to this well presented report. The total number of cases reported in the literature is few, and one should note that Dr. McGillicuddy speaks only of meningoencephalocele, omitting the pure meningocele and the encephalocele.

He is to be congratulated on being the third to report a case of a living patient and on his clinical acumen in suspecting what he had to deal with prior to operation. It appears to be true that the simple procedure of removing what appears to be an ordinary polyp may result in rapid death from meningitis. If no postmortem examination is made the surgeon may blame himself unnecessarily. Hence, from a diagnostic point of view, if roentgen examination were made in

every case of apparent nasal polyp, it might be possible on occasion to detect a defect in the skull and so to suspect an unusual condition.

It has further been suggested that injection of air into the mass under suspicion would differentiate it from a pure meningocele, since no air would appear in the ventricles.

DR. HOWARD C. BALLENGER: Dr. McGillicuddy is to be congratulated on the successful outcome in this case. I understood him to say there is some difference of opinion as to the origin of meningoencephalocele, that it might arise from an embryonic rest of the central nervous system. That could be true of an encephalocele or a glioma, without meninges, but it would seem that a meningoencephalocele requires a defect or dehiscence in the base of the skull.

DR. HANS BRUNNER: Fortunately, up to the present I have not seen a case of meningocele within the nose. However, I know of a case in which a meningocele was misinterpreted as an ordinary nasal polyp. Procaine hydrochloride was injected into the mass, and the patient died immediately.

I wish to ask whether an encephalogram was made in Dr. McGillicuddy's case; also, I should like to know how the patient reacts to an intravenous injection of hypertonic solution of dextrose. Both procedures are of therapeutic interest, the encephalographic test by producing a slight irritation of the meninges and the injection of a hypertonic solution of dextrose by decreasing the pressure of the cerebrospinal fluid. Finally, I suggest that prior to further operation in this case a trial be given to high voltage irradiation of the choroid plexus.

DR. OLIVER MCGILLICUDDY: Since Dr. Pearlman also has reviewed the literature, he could, I am sure, have pointed to many errors of omission in my paper. He did not include a case of O'Brien's because the tumor was not a true encephalomeningocele but contained only meninges and cerebrospinal fluid.

Dr. Ballenger brought up the question of the difference between encephalomeningocele and encephalocele. All congenital extracranial tumors containing brain tissue and meninges should be classified as encephalomeningoceles, whether or not they are attached to the brain by a pedicle. Cases have been reported in which the growth contained only brain tissue, and such a tumor should be classified as an encephalocele. If, as in O'Brien's case, there are only cerebrospinal fluid and meningeal tissue, the tumor should be called a meningocele.

Dr. Brunner brought up the question of the encephalographic examination to determine whether or not the tumor was connected with a ventricle. This procedure would be of great value before operation. His suggestion of roentgen ray therapy to the choroid plexus is also excellent. Lempert suggested frequent spinal punctures to reduce the cerebrospinal fluid pressure. Prior to operation, and for a short time afterward, this boy did not attend school because of the continuous drainage from his nose when he held his head forward. That has practically stopped, but as long as there is an opening I think he is safer with rhinorrhea.

As I stated, many cases of this tumor must be missed. I have encountered the present case and 1 other which was similar. Eight years ago I saw a man in consultation who was dying of meningitis. Autopsy revealed a large dehiscence in the cribriform plate. The general surgeon, who had removed a large, apparently innocent polyp in his office, was amazed at the opening through the cribriform plate. He had used some traction on the polyp but could not understand how he had been able to pull away part of the cribriform bone. The obvious answer is that he had removed an encephalocele, but this could not be proved because the polyp had been discarded without examination.

Histopathologic Changes in the Temporal Bone in Paget's Disease. DR. M. TAMARI.

The histologic changes in the temporal bone associated with Paget's disease are quite different from those of the skull or other bones of the body. This is due to the formation of the labyrinthine capsule, which consists of three layers: the inner, or endosteal, built on a connective tissue base; the middle, or enchondral, and the external, or periosteal. These three layers show a different response to

the new bone invading from without. In the early stages the disease begins with fibrosis of the marrow spaces; later there occurs destruction of the bone, alternating with formation of new bone, a process leading to the well described mosaic structures.

Included in the study are 3 new cases of Paget's disease, with bilateral involvement in each case. In 1 case the condition was complicated by acute otitis media and metastatic sarcoma.

The microscopic sections show that the bony changes begin in areas best supplied with marrow tissue. The labyrinthine nucleus, because of its almost marrowless structure, is least susceptible to change. (The periosteal layer has been reconstructed in each case.) The enchondral, or middle, layer resists for a time the rebuilding power. The greatest resistance is shown by the endosteal layer, the modiolus, the area cribrosa and the outer plate of the fallopian canal in its course in the middle ear.

The new bone approaches the inner layer of the labyrinthine capsule in a humplike formation, which seems to be dependent on the vascular supply. The resistance of the inner layer causes deformation of the spiral laminas of the bone and the inner surface of the cochlea, the vestibulum and the semicircular canal.

Paget's disease of the temporal bone gives the clinical picture of conduction deafness. With progression of the disease it changes to mixed impairment of hearing and finally results in total deafness. At first the vestibular response is normal. Only in the later stages does hypoirritability of the equilibratory apparatus appear. This is probably because the changed bone conduction delays reaction to heat and cold.

DISCUSSION

DR. ELMER W. HAGENS: Dr. Tamari's paper gives an excellent and detailed description of this unusual condition. I have no temporal bones showing this disease; it might be interesting, nevertheless, to compare the condition with otosclerosis. A most important point in differentiation is that otosclerosis is a focal condition and Paget's disease is diffuse. In some otosclerotic bones the process occurs at the round window, the cochlea and the semicircular canals, but between the foci the original bone is present. The early deafness of otosclerosis is due to fixation of the foot plate. When inner ear deafness develops some other factor is operative. To my knowledge, no one has ever proved what causes the inner ear deafness of otosclerosis. The factors Dr. Tamari mentioned as explaining deafness in his cases, such as development of haversian canals, probably are not involved in cases of otosclerosis. In the specimens of otosclerosis I have studied bone cells were scattered, and when I did see haversian systems they appeared to have been left over, rather than to represent new formation. Remnants of cartilage were hardly ever seen. At the margin it was uncommon to see osteoclasts. They were more numerous in the focus itself, more centrally located. Otosclerosis progresses with finger-like projections from the focus. The marrow spaces are vascular and fibrous.

Paget's disease seems to occur more frequently in older men, whereas otosclerosis occurs earlier in adult life, and more often in women. Neither disease seems to involve the ossicles; cases have been reported, but rarely. I do not think otosclerosis is ever observed in the mastoid. The otosclerotic process can extend to the periosteal or to the endosteal layer or to both. The endosteal layer resists this process, and even infection, for a long time.

JEROME F. STRAUSS, M.D., *President*

Regular Meeting, April 6, 1942

Development of the Human Stapes. DR. BARRY J. ANSON.

The stapes appears at the 7 mm. stage at the cranial extremity of the second visceral bar. It is located lateral and caudal to, but wholly separate from, the primordial optic capsule. The stapedial artery appears at the 8 mm. and persists

until the 30 mm. stage. Connection between the stapes and the hyoid bar is maintained without differentiation until the 30 mm. stage. Transition from dense mesenchyme to precartilage occurs during the 17 to 22 mm. interval; further differentiation into cartilage occupies the 25 to the 30 mm. stages. Concomitant growth of the stapes and capsule, from the 10.6 mm. embryo onward, results in approximation of these structures. That portion of the lateral capsular wall in juxtaposition to the stapes represents the lamina stapedialis; subsequent obliteration of the delimiting zone of fibroblasts on the stapedial base brings fusion of that visceral derivative with the capsule. Active growth of stapedial cartilage eliminates the outer cellular stratum of the lamina and brings the base into apposition with the deeper fibroblastic layer, which is subsequently applied to the vestibular surface of the stapes (43 mm.; 50 mm.). The foot plate arises chiefly from the precartilaginous laminar remnant, between the stapedial base and the fenestral margin.

The definitive chondral form of the stapes is attained during the 75 to 100 mm. interval. In subsequent stages, until ossification begins, the chief alteration is one of growth.

Conversion into bone has begun by the 150 mm. stage. A center of ossification appears on the obturator surface of the base and spreads, first posteriorly, then anteriorly, to involve corresponding crura and, lastly, the neck and head. With the onset of ossification, growth is abruptly curtailed; this is to be expected in a preosseous structure lacking the customary mechanism of elongation, i. e., epiphysial cartilage. Adult stapedial dimensions are thereby approached or attained by the twentieth week of intrauterine development.

The vestibular window may be subjected to alteration by the following factors: the upward growth of the promontory; stapedial overlapping of the anterior fenestral margin, and marginal overlap of the anterior portion of the stapedial base. The fenestral margin is one of the last capsular regions to undergo ossification.

DISCUSSION

DR. HENRY B. PERLMAN: Having had occasion recently to make a reconstruction of a portion of the labyrinth from serial sections, I can appreciate the great amount of work and careful judgment that have gone into Dr. Anson's study. Perhaps the clinician assimilates this embryologic information in a different way than the anatomist, but both realize that there are gaps in knowledge that must be filled in. As otologists, we are continually confronted with the unanswered questions concerned with the normal function of the stapes and the whole baffling problem of otosclerosis with stapes fixation. In Professor Anson's embryologic investigations on the development of the stapes and the adjacent otic capsule, as in the studies of Bast on the growth and ossification of the otic capsule, one looks for clues to the solution of some of these problems. The embryonic development of the ear is such a complex process that it is amazing that Nature does not more often get mixed up and produce an imperfect mechanism. But embryonic malformations of the ear are rarely encountered, either in the clinic or in the laboratory. We here have just learned that the stapes is full grown in the 5 month old fetus, and in general the conducting mechanism and the labyrinth, with its intimate bony capsule, are full grown at birth. From that time on, since no growth is required, the capsule bone remains as inert as any living tissue can be. The periosteal layer of the capsule is an exception. With its growth the niche of the oval window may become very deep, so that it surrounds almost the entire stapes. The crura, then, are very close to the wall of the niche. Under these circumstances, bands of adhesions are easily formed between the crura and the wall of the niche and may impair the motion of the stapes. The niche is so deep and narrow that it is readily obliterated by connective tissue in chronic inflammation and in the radical mastoidectomy cavity.

Such an ear, even without an ossicular chain, functions more poorly to airborne sound than one in which the niche is open and the stapes is not bound by connective tissue. In cases of endemic cretinism Nager has shown that the overgrowth of the periosteal layer of the otic capsule on the side of the middle ear may be so great as to obliterate the niches of the oval and round windows.

The human infant is born with full-grown mature labyrinths. The enchondral and endosteal layers of the labyrinthine capsule remain inactive during the rest of life. Microscopic inspection of a focus of otosclerosis reveals that it is made up of new bone and that this is replacing the old capsule bone. From where does this new bone arise, since all the normal capsule bone is so inert? An island of connective tissue and cartilage in the capsule, fissula ante fenestrum, is probably a clue to this question. It is interesting that this structure is observed only in the human ear. As has been seen, the structure extends through the entire bony capsule, just in front of the oval window. No one knows why it is there, but any stimulus inducing bone activity can find in this unstable tissue a suitable medium for reaction, and this stimulus may start here a process of new bone formation at the expense of the old capsule bone. The process may stop before the annular ligament is invaded, and then no clinical symptoms are produced. Otosclerosis most commonly begins in this part of the otic capsule. Other minute foci of unstable preosseous and osseous tissue may, as Bast has suggested, be present in some otic capsules that may be responsible for otosclerotic foci present in regions other than the neighborhood of the oval window. In embryologic studies, such as the one reported here, one seeks to establish a normal pattern of the development of the otic capsule and stapes. This may help subsequently in finding abnormal patterns, such as may be present, perhaps, in the fetus of an otosclerotic mother.

The stapes weighs 2.8 mg. This small mass moves through an exceedingly small distance when driven by the rest of the conducting mechanism in response to an acoustic stimulus. While for threshold sounds the amplitude of movement is much less than the diameter of a molecule of water in a connective tissue fiber of the annular ligament, much greater movements are imparted to it by large acoustic stimuli. These movements are great enough to be visualized with small magnification and can be photographed. The movements of the foot plate are not simple in and out, piston-like displacements but constitute a rocking motion, greatest at the anterior end of the foot plate. This is facilitated by the increased width of the annular ligament in the anterior portion. At the same time, the elasticity of the annular ligament is great enough to permit slow mass displacement of the entire stapes, as when static pressure is applied to the drum, which one often does with a Seigle's speculum or when the stapedius muscle pulls the unattached stapes into the niche of the oval window.

Dr. C. C. Bunch: I do not see how anything can be added to this beautiful demonstration. All have been overwhelmed by the problem of how the ear works, and this is enlightening. I want to congratulate the speaker on the excellent work that is being done.

Dr. Barry J. Anson: It is attempted in this anatomic study of the human stapes to establish the norm in gross form and histologic structure. Without such knowledge of the morphologic character of the stapes, based on the developmental history of the ossicle, it would not be possible to judge accurately the extent and kind of pathologic damage produced by otosclerosis, otitis and kindred diseases. My associates and I have under way a comparable study of the malleus and incus.

It is recognized that the cartilage of the vestibular (oval) window and the various tissues surrounding and occupying the fissula ante fenestrum are inseparably linked with the stapes in pathologic change. These portions of the capsule have been studied extensively in our laboratory; I have purposely omitted mention of them because even a brief report on the results of our investigations would have lengthened my paper beyond reasonable bounds.

Prosthetic Correction of Inoperable Facial Defects, with a Moving Picture Demonstration and Presentation of a Patient. Dr. Adolph M. Brown.

A man in his twenties has been under treatment at three university clinics during the past eight years. He has 4 plus Wassermann and Kahn reactions. Dr. Tibor Benedek raised two cantharis blisters on his skin, aspirated the serum from the

blisters and injected the liquid into 4 guinea pigs. All the animals suffered total destruction of the face, including the eyes. Benedek found Leishman bodies in the livers of all 4 animals.

At present the patient is getting injections of fuadin and says that he has pain in the lesions of the face after each injection. He believes that the injections of antimony are controlling the lesions. He has no lips; therefore salivation has been a problem. Dr. T. K. Lawless feels that much of the skin destruction is caused by salivation.

Since the prosthetic mask has been furnished the patient, he has improved mentally; he is well oriented, well balanced and fairly intelligent. The mask is held in place by an adhesive made of mastic, resin and chloroform. It is waterproof and perspiration proof and thus far has been found to be nonallergenic. One patient was found to be sensitive to the latex. This mask has been provided with recesses inside the prosthesis, which contain cotton pads to collect saliva, in the hope of controlling the destruction of the skin.

DISCUSSION

DR. FRANCIS LEDERER: This excellent work should not be passed without commendation. Certainly, great appreciation is voiced by the patient, whose personality and outlook on life have been helped tremendously. The history is interesting; it was reported as the first autochthonous case of leishmaniasis by Benedek (*J. Trop. Med.* **43**:147 [June 1] 1940). No source of infection was discovered in this case. It was Benedek's contention that American leishmaniasis was confused with syphilitic and other infectious granulomas. When I first observed this patient I was reminded of the cases of syphilis mutilans. He has congenital syphilis, but the histologic and bacteriologic examinations disclosed Leishman bodies.

The subject of rubber prosthesis has long interested me, for I presented a paper on the use of such material before this society in 1928 (Prosthetic Aids in Reconstructive Surgery About the Head: Presentation of a New Method, ARCH. OTOLARYNG. **8**:531 [Nov.] 1928). At that time I was employing a gelatin mixture, and later Peluse, in my department, reported on the use of latex rubber. The great problem is to obtain the proper color. The indications for the use of such material are clear. It can be applied in cases in which extensive destruction does not warrant plastic repair and in replacing parts, such as the ear or nose, when further observation of the area is desirable before attempting reparative surgery. This work is a labor of love, and when a man possesses the requisite artistic talent and will sacrifice the necessary time, he is to be congratulated and others must consider themselves fortunate in having his aid.

DR. ELMER HAGENS: How durable are the masks, and how long does one last?

DR. ALFRED LEWY: I suggest using radiation instead of medicaments to reduce the salivary secretion. Irradiation is commonly employed for that purpose.

DR. ADOLPH M. BROWN: This patient has had three masks since October. The first one wore out quickly, because he had not learned how to handle it. He is now rather expert and removes and replaces the prosthesis with skill, as you have seen. Since the jaw is ankylosed, he removes the prosthesis a few times each day in order to eat. However, he is able to take liquids through a straw or drinking tube through the artificial lips of the mask. A latex prosthesis should last several months. This prosthesis is exceptionally large; in fact, there is no record in the literature of one as large as this. The smaller prostheses last much longer.

A New Approach to the Treatment of Snoring. DR. JEROME F. STRAUSS.

On the basis of the theory that true functional snoring is caused by the vibrations of the soft palate, uvula and posterior pillars and that the sound produced is related to the natural periodic vibration of the tissues involved, it is suggested that the "fluttering" facors be modified by producing a controlled fibrosis in the

vibrating soft tissues through the injection of a sclerosing solution, such as sylnasol (a 5 per cent solution of the sodium salts of certain of the fatty acids of the oil extracted from a seed of the psyllium group).

In this preliminary report, 4 cases are presented: in 1 of these cases snoring has been eliminated, in 2 there is definite improvement and in 1 no result whatever.

DISCUSSION

DR. SAMUEL SALINGER: Dr. Strauss deserves tremendous credit for undertaking the serious study of a topic so grossly neglected. The fact that he could find only 2 references in the literature shows that the subject has been woefully shunned. Knowing nothing of the scientific aspect of the subject, I naturally thought of its humorous side and looked it up in Bartlett's "Quotations," only to find one from Morley and one from Shakespeare, neither of them very funny.

I always thought that snoring was due to lack of tonicity in the soft palate, which came on during sleep and depended not only on anatomic configuration but on the degree of relaxation or the depth of sleep. People have good nights and bad nights, and it seemed to me that the depth of sleep was the probable explanation of the snoring. Dr. Strauss has suggested something else that struck home, namely, the question of the flutter rate of the soft palate. He thinks he can change the flutter rate by altering the density of the soft palate in the patient, and thus eliminate snoring. It occurred to me that no one has thought of investigating the question of snoring among patients who have had tonsillectomy, particularly adults in whom scarring or fusion of the pillars has taken place, thus stretching the palate and altering its form. Perhaps a study of these patients after, as well as before, operation, might throw some light on the subject. The unwilling victims of the snorer need help, and any effort to solve the problem is praiseworthy.

DR. HOWARD C. BALLENGER: Snoring in a child usually means adenoids. However, in adults, I am impressed by the number who have an excessively high-arched hard palate, the "Gothic arch palate." These people are frequently chronic snorers, even thought their nasal passages are open and their palatine musculature seems normal.

DR. FRANCIS LEDERER: The factor of nasal obstruction in the causation of snoring does not impress me much. While patients have been referred for submucous resection because of snoring, I have never seen any good results from the operation.

Dr. Strauss did not mention the role of the tongue in snoring. The tongue is in a relaxed state when the person is asleep on his back, and this is a factor in snoring. There is frequently a great deal of mental anguish connected with this sociologic problem, and I believe its effectual control would be a boon to mankind. Dr. Strauss should be congratulated on his sober interest in the matter. I have noted that snoring and disturbed sleep occasionally accompany an elongated uvula, but I have also observed patients with the uvula partly resected whose snoring had not been eliminated.

DR. WALTER H. THEOBALD: I have a patient, now 46, whose tonsils had been removed at the age of 4 or 5, in the days when the uvula frequently got entangled with the tonsil snare. The uvula was entirely absent, and she had a high archway of scar tissue. I asked her whether she snored, and she said she did not know but had never been told she did. I think Dr. Salinger's suggestion might be used to find out whether the removal of the tonsils and uvula affects snoring.

DR. JEROME STRAUSS: During the nine months I have been carrying on this study in the laboratory and the office, I have looked at every palate and pharynx carefully. I am not sure that Dr. Ballenger is not correct, although I should be inclined to think the depth of the pharynx a more important factor.

Directory of Otolaryngologic Societies *

NATIONAL

American Medical Association, Scientific Assembly, Section on Laryngology, Otology and Rhinology

Chairman: Dr. Claude C. Cody, 1304 Walker Ave., Houston, Texas.
Secretary: Dr. Louis H. Clerf, 1530 Locust St., Philadelphia.
Place: San Francisco.

American Academy of Ophthalmology and Otolaryngology

President: Dr. Ralph I. Lloyd, 14–8th Ave., Brooklyn.
President-Elect: Dr. James A. Babbitt, 1912 Spruce St., Philadelphia.
Executive Secretary: Dr. William P. Wherry, 1500 Medical Arts Bldg., Omaha.
Place: Chicago. Time: Oct. 11-14, 1942.

American Broncho-Esophagological Association

President: Dr. Robert L. Moorhead, 125 Ramsen St., Brooklyn.
Secretary: Dr. Paul Holinger, 700 N. Michigan Ave., Chicago.

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SECTIONS:

Eastern.—Chairman: Dr. Edward J. Whalen, 750 Main St., Hartford, Conn.
Southern.—Chairman: Dr. Francis B. Blackmar, Swift Kyle Bldg., Columbus, Ga.
Middle.—Chairman: Dr. Voss Harrell, Hofman Bldg., Detroit, Mich.
Western.—Chairman: Dr. Irving M. Lupton, Medical Arts Bldg., Portland, Ore.

American Otological Society

President: Dr. Wesley C. Bowers, 17 E. 61st St., New York.
Secretary: Dr. Isidore Friesner, 101 E. 73d St., New York.

* Secretaries of societies are requested to furnish the information necessary to keep this list up to date.